Technical Specifications, Connections, and Chassis Overview

Index of this chapter:

1. Technical Specifications
2. Connections
3. Chassis Overview

Note: Figures below can deviate slightly from the actual situation, due to the different set executions.

Technical Specifications

Vision

Feature	Data
• Display type	: DV-CRT-RF
• Screen size(s)	: 26 inch - 16:9 : 27 inch - 4:3 : 30 inch - 16:9 : 32 inch - 4:3 : 34 inch - 16:9
• Tuning system	: PLL
• IF frequency	: 45.75 MHz
• Color systems	: NTSC M (3.58-4.5)
• Channel selections	: 181 presets : Full cable, UHF
• Video playback	: ATSC : 480p : 1080i
• Aerial input	: 75 ohm, F-type

Sound

Feature	Data
• Sound systems	: BTSC DBX
• Maximum power	: 2 x 10 W_rms (int.)

Miscellaneous

Feature	Data
• Mains voltage	: 110 V_ac
• Mains frequency	: 50 / 60 Hz
• Ambient temperature	: +5 to +45 deg. C
• Maximum humidity	: 90 % R.H.

Power consumption

Feature	Data
• - Normal operation	: ≈ 159 W
• - Standby	: < 1 W

Connections

Note: The following connector color abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, Ye= Yellow.

Top Control and Front / Side Connections

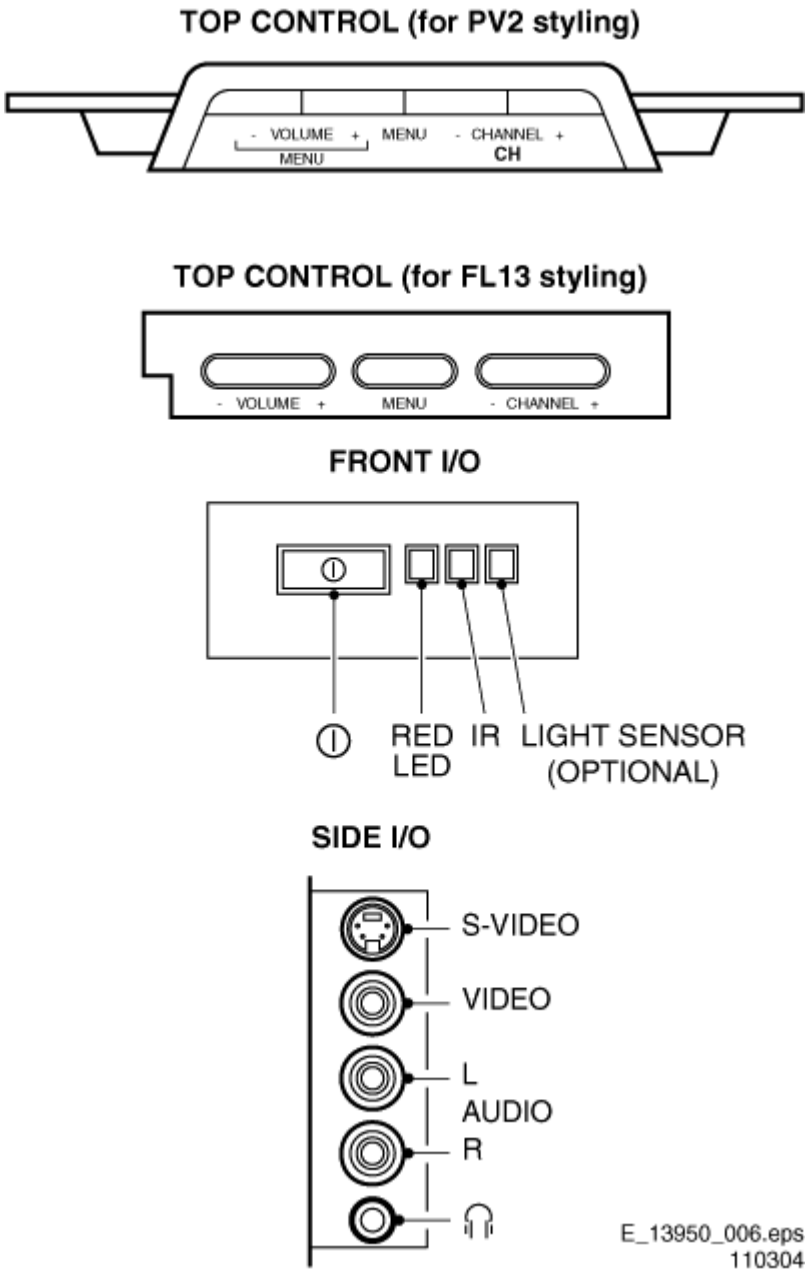


Figure: Top control and Front / Side connections

Hosiden: SVHS - In

Connector	Kind	Value	Symbol
1	Y	Ground	⏚
2	C	Ground	⏚
3	Y	1 V_pp / 75 ohm	⊕

4	C	0.3 V_pp / 75 ohm	

Audio / Video In

Connector	Kind	Value	Symbol
Ye	Video (CVBS)	1 V_pp / 75 ohm	
Wh	Audio - L	0.2 V_rms / 10 kohm	
Rd	Audio - R	0.2 V_rms / 10 kohm	

Mini Jack: Headphone - Out

Connector	Kind	Value	Symbol
	Headphone	32 - 600 ohm / 10 mW	

Rear Connections

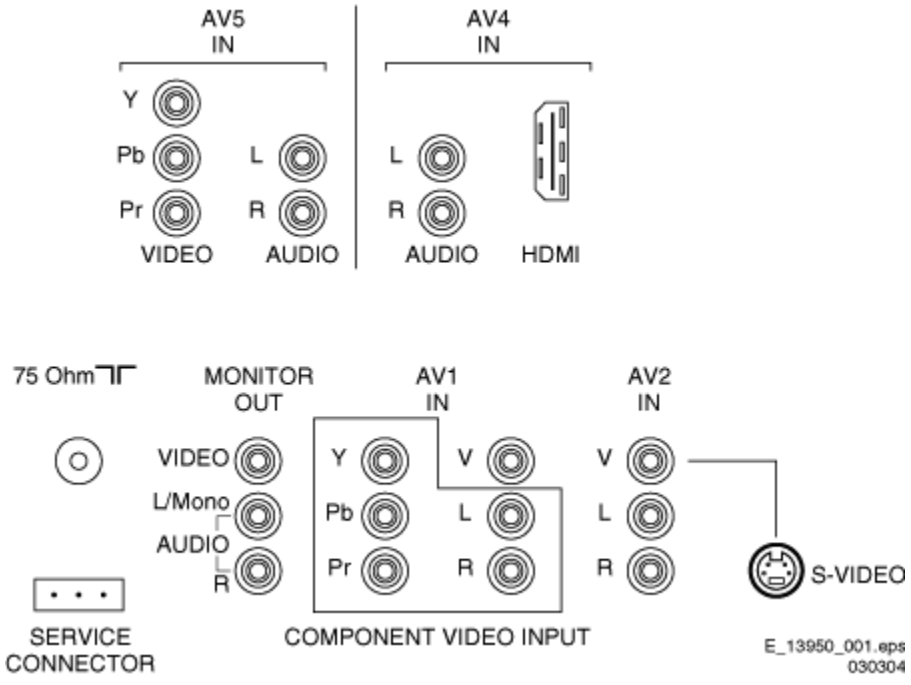


Figure: Rear connections

Aerial In

Connector	Kind	Value	Symbol
	F-type	Coax, 75 ohm	

Monitor Out

Connector	Kind	Value	Symbol
Ye	Video (CVBS)	1 V_pp / 75 ohm	
Wh	Audio - L	0.5 V_rms / 1 kohm	
Rd	Audio - R	0.5 V_rms / 1 kohm	

AV1 In

Connector	Kind	Value	Symbol
Gn	Y	0.7 V_pp / 75 ohm	
Bu	Pb	0.7 V_pp / 75 ohm	
Rd	Pr	0.7 V_pp / 75 ohm	
Ye	Video (CVBS)	1 V_pp / 75 ohm	
Wh	Audio - L	0.5 V_rms / 10 kohm	
Rd	Audio - R	0.5 V_rms / 10 kohm	

AV2 In

Connector	Kind	Value	Symbol
Ye	Video (CVBS)	1 V_pp / 75 ohm	
Wh	Audio - L	0.5 V_rms / 10 kohm	
Rd	Audio - R	0.5 V_rms / 10 kohm	

AV2 In (SVHS)

Connector	Kind	Value	Symbol
1	Ground	GND	
2	Ground	GND	
3	Y	1 V_pp / 75 ohm	
4	C	0.3 V_pp / 75 ohm	

AV4 In (not used for 27/32MS series)

Connector	Kind	Value	Symbol
Wh	Audio - L	0.5 V_rms / 10 kohm	
Rd	Audio - R	0.5 V_rms / 10 kohm	

HDMI (not used for 27/32MS series)

Connector	Kind	Value	Symbol
1	RX2+	Data channel	
2	GND	Ground	
3	RX2-	Data channel	
4	RX1+	Data channel	
5	GND	Ground	
6	RX1-	Data channel	
7	RX0+	Data channel	
8	GND	Ground	
9	RX0-	Data channel	
10	RXC+	Data channel	
11	GND	Ground	
12	RXC-	Data channel	
13	n.c.		
14	n.c.		
15	DDC SCL	DDC clock	
16	DDC SDA	DDC data	
17	GND	Ground	
18	+5V		
19	HPD		
20	GND	Ground	
21	GND	Ground	

22	GND	Ground	⏚
23	GND	Ground	⏚
24	GND	Ground	⏚

AV5 In

Connector	Kind	Value	Symbol
Gn	Y	0.7 V_pp / 75 ohm	
Bu	Pb	0.7 V_pp / 75 ohm	
Rd	Pr	0.7 V_pp / 75 ohm	
Wh	Audio - L	0.5 V_rms / 10 kohm	
Rd	Audio - R	0.5 V_rms / 10 kohm	

Alignments

Index of this chapter:

1. General alignment conditions
2. Hardware alignments
3. Software alignments
4. Option settings

General Alignment Conditions

Default Alignment Settings

Perform all electrical adjustments under the following conditions:

- Power supply voltage: 120 V_ac / 60 Hz (± 10 %).
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 20 to 30 minutes.
- Measure voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). **Caution:** never use heatsinks as ground.
- Test probe: Ri > 10 Mohm, Ci < 20 pF.
- Use an isolated trimmer/screwdriver to perform alignments.

Perform all electrical adjustments with the following default settings (for all CRTs):

- Choose 'Weak' picture mode with the (Smart) 'Picture' button on the remote control.
- Set 'Dynamic Contrast' (accessible via MENU -> PICTURE) and 'Active Control' (on remote control) to 'off' (if either one of them is present).
- Set 'Brightness' (accessible via MENU -> PICTURE) to aligned value unless otherwise specified.

Adjustment Sequence

Use the following adjustment sequence:

1. Set the correct TV-set OPTIONS as described in paragraph 'Options'. After storing, re-start the set.
2. Rough adjustment of VG2 and FOCUS.
3. RF-AGC alignment.

4. IF-PLL OFFSET adjustment.
5. Rough adjustment of GEOMETRY.
6. Allow the set to warm up.
7. Precise adjustment of VG2 and FOCUS.
8. Precise adjustment of GEOMETRY.
9. PIP alignments (if present).
10. COLOR alignments.
11. Other software alignments.

Hardware Alignments

Notes:

- The Service Alignment Mode (SAM) is described in chapter 5 'Service Modes, Error Codes, and Fault Finding'.
- Use the cursor-, menu-, and OK-buttons of the remote control (RC) transmitter for navigation.

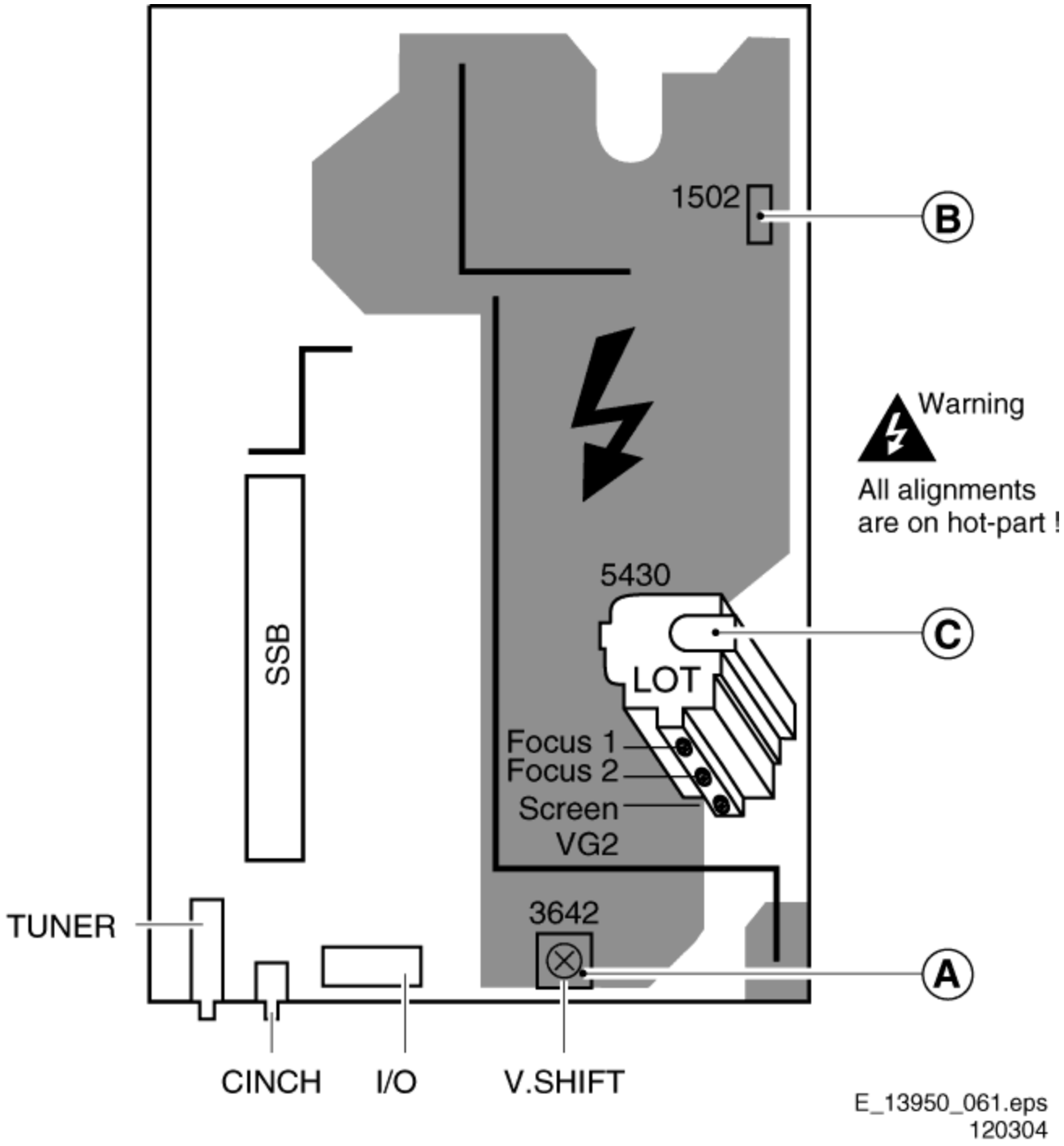


Figure: Top view LSP

Vg2 Adjustment

Notes:

- For adjusting the Vg2 in A10 sets, the vertical scan had to be disabled by the VSD bit (Vertical Scan Disable). However, do **not** use this option in this chassis (when present, because not used in all software), as it will lead to a 'beam current' protection!
- The 'VG2' option in SAM is not active. Do **not** use this option.

In the frame-blanking period of the R, G, and B signals applied to the CRT, the video processor inserts a measuring pulse with different DC levels. Measure the black level pulse during the vertical flyback at the RGB cathodes of the CRT.

1. Connect the RF output of a pattern generator to the antenna input. Input a 'black' picture (blank screen on CRT without any OSD info) test pattern.
2. Use the MENU key to enter the 'user' menu, select 'Picture', and set 'Brightness' and 'Contrast' to minimum (write down the original settings).
3. Set the oscilloscope to 20 V/div and the time base to 20 us/div. Use external triggering on the vertical pulse (**caution** : use a trigger point on the ' **cold** ' side!)
4. Ground the scope on the CRT panel (' **cold** ' side) and connect a 10:1 probe to one of the cathodes of the picture tube socket (see circuit diagram F).
5. Measure at test points F017, F018 and F019 on the picture tube socket (or pins 6, 8, and 11) the DC-level of the measuring pulse (1st full line after the frame blanking) with respect to earth.
6. Select the pin with the highest level found and adjust V_cutoff by means of the Vg2-potmeter (lowest-one) on the Line Output Transformer (LOT) to 160 V +/- 3 V_dc (for 34" screen size) or 152 V +/- 3 V_dc (for screen sizes smaller than 34").
7. Reset 'Contrast' and 'Brightness' to their original values (as written down).

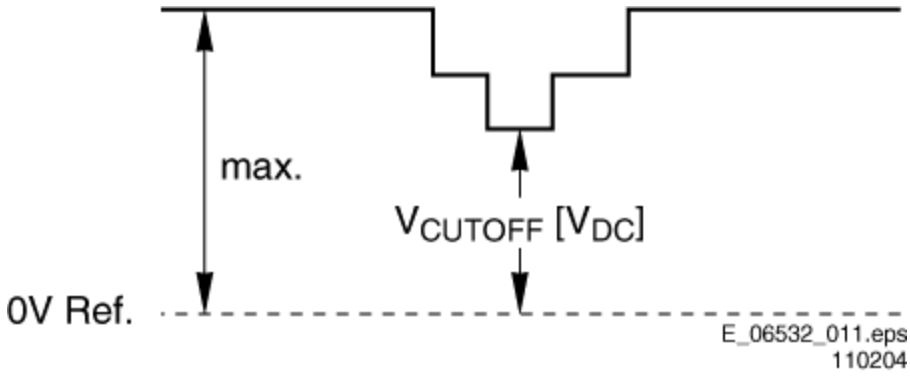


Figure: Waveform Vg2 alignment

Focus alignment

The LOT has the following outline:

- Focus 1 (F1)= Static alignment (black wire).
- Focus 2 (F2)= Dynamic alignment (red wire).

1. Use an external video pattern generator to input a 'circle' or 'crosshatch' test pattern to the set.
2. Choose 'Weak' picture mode with the (Smart) 'Picture' button on the remote control transmitter.
3. Adjust the 'dynamic focus 2' potentiometer (in the middle on the LOT) until the horizontal lines at the centre of the screen are of minimum width without introducing a visible haze.
4. Adjust the 'static focus 1' potentiometer (highest of the LOT) until the horizontal lines at the sides of the screen are of minimum width without introducing a visible haze.
5. Repeat these two steps to achieve the best result.

Software Alignments

Put the set in the SAM (see the 'Service Modes, Error Codes and Fault Finding' section). The SAM menu will now appear on the screen. The different alignment parameters are described further on.

Notes:

- All changes to menu items and alignments must be stored manually.
- If an empty EAROM (permanent memory) is detected, all settings are set to pre-programmed default values, so the set must be re-aligned.

TUNER

IF PLL OFFSET

No adjustments needed: default value is '35'.

If the mentioned default value does not give the required result, use the following alignment method:

1. Set an external pattern generator to a crosshatch video signal and connect the RF output to the aerial input of the TV. Set the amplitude to 10 mV and the frequency to 61.25 MHz. Use system NTSC M if possible, otherwise match the system of your generator with the received signal in the set.
    - For 'Negative modulation', the **sound** signal must be a non-modulated FM signal.

- For 'Positive modulation', the **video** signal must have high modulation (100% or above).

2. Put the set in the SAM mode.
3. Select via the TUNER menu, the IF-PLL OFFSET sub-menu.
4. Measure and align:
   - For 'Negative modulation', on MONITOR OUT (**audio**): Adjust IF-PLL OFFSET until the largest Signal Noise Ratio (SNR) is reached.
   - For 'Positive modulation', on MONITOR OUT (**video**): Adjust IF-PLL OFFSET until you get minimal V-sync disturbance.

AGC

1. Set an external pattern generator to a color bar video signal and connect the RF output to the aerial input of the TV. Set the amplitude to 10 mV and the frequency to 61.25 MHz. Use system NTSC M if possible, otherwise match the system of your generator with the received signal in the set.
2. Put the set in the SAM mode.
3. Select via the TUNER menu, the AGC sub-menu.
4. Connect a DC multi-meter to pin 1 of the tuner (item 1200 on the LSP).
5. Adjust the AGC until the voltage at pin 1 of the tuner is 3.3 V (+/- 0.1 V). The value can be incremented or decremented by pressing the right/left CURSOR button on the RC.
6. After alignment, save the value(s) with the STORE command in the SAM main menu.

2nd AGC

Same alignment as AGC-alignment however for a second tuner (when applicable, e.g. PIP or DW).

WHITE TONE

In the WHITE TONE sub menu, the color values for the different color temperatures can be aligned.

The color temperature mode (NORMAL, DELTA COOL, DELTA WARM) can be selected per color (R, G, and B) with the RIGHT/LEFT cursor keys. The mode or value can be changed with the UP/DOWN cursor keys.

First, the values for the NORMAL color temperature must be aligned. Then the offset values for the DELTA COOL and DELTA WARM mode can be aligned. Note that the alignment values are non-linear.

Alignment

No adjustments needed. Use the given default values:

Table: White tone alignment (default values)

Parameter	27PT8302/37	32PT8302/37	30PW8402/37	34PW8402/37
Normal Red	6	0	0	0
Normal Green	-2	-8	-7	-8
Normal Blue	2	1	-6	1
Red BL Offset	7	7	7	7
Green BL Offset	7	7	7	7
Blue BL Offset	7	7	7	7
Delta Cool Red	0	0	0	0
Delta Cool Green	2	3	2	2
Delta Cool Blue	11	12	12	10
Delta Warm Red	0	0	0	0
Delta Warm Green	-7	-6	-8	-7
Delta Warm Blue	-22	-20	-24	-21

If the mentioned default values do not give the required result, use the following alignment method:

1. Set the external pattern generator to a 100% white pattern, and connect the RF output to the aerial input of the TV. Set the amplitude at least 1 mV_rms (60 dBuV) and the frequency to 61.25 MHz. Use system NTSC M if possible, otherwise match the system of your generator with the received signal in the set.
2. Set 'Smart Picture' to 'Weak'.
3. Set 'Dynamic NR' to 'off' (accessible via MENU -> Features).
4. Put the set in the SAM mode.
5. Set NORMAL GREEN to '32'.
6. Measure with the color analyzer (Minolta CA100 Color Analyzer or equivalent), calibrated with the spectra, on the centre of the screen.
7. Adjust with the cursor left/right command the Red and Blue register for the right xy-coordinates (see next table).
8. Repeat the white tone adjustment also for the color temperatures COOL and WARM.

Table: White tone alignment (with color analyzer)

White D mode	Temperature	DUV	x	y
Normal	9300 K	+-0.003	282 +/- 8	298 +/- 8
Cool	12000 K	+-0.003	270 +/- 8	280 +/- 8

Warm	6500 K	+-0.003	315 +/- 8	325 +/- 8

GEOMETRY

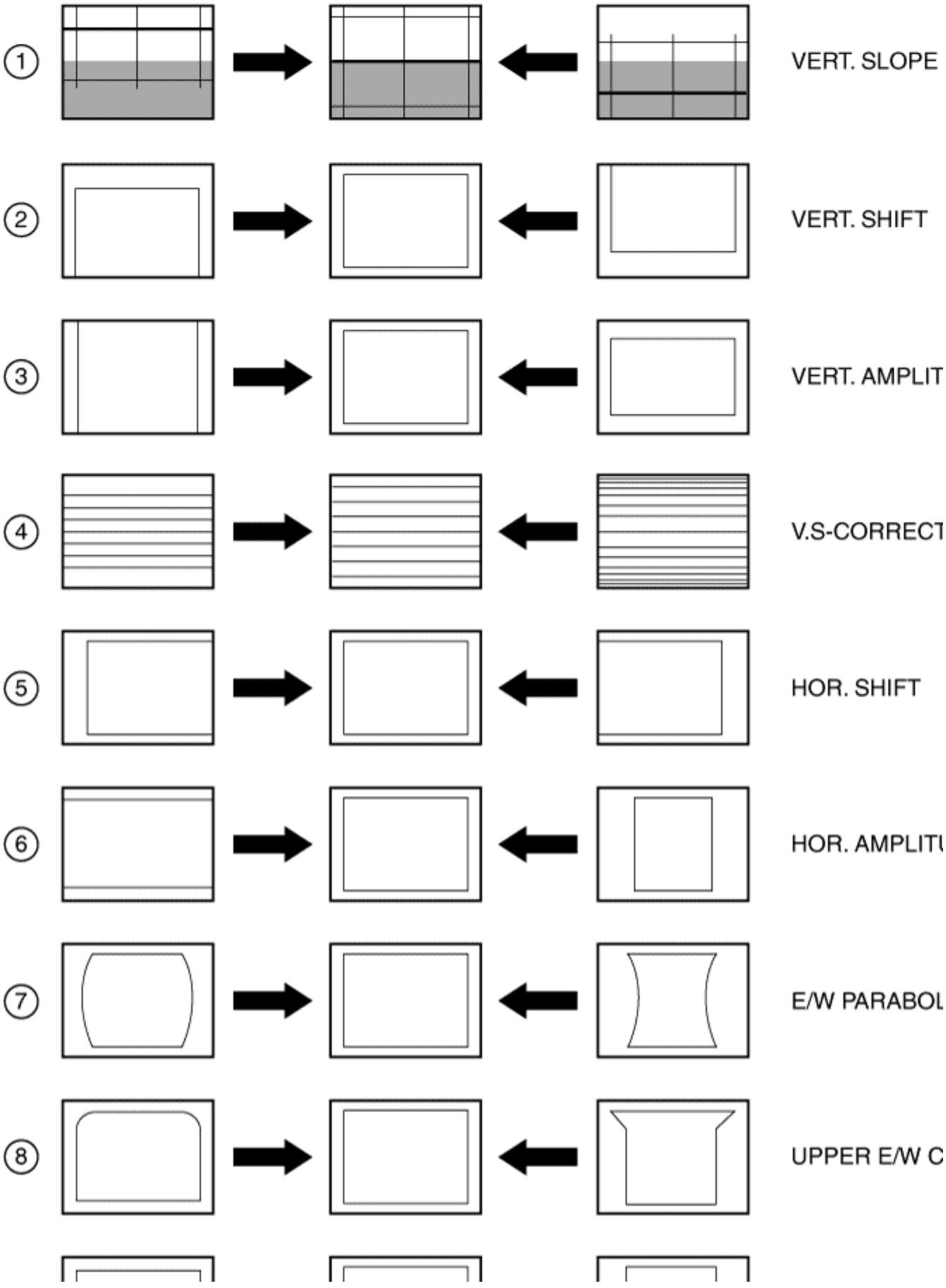

1
VERT. SLOPE
2
VERT. SHIFT
3
VERT. AMPLIT
4
V.S-CORRECT
5
HOR. SHIFT
6
HOR. AMPLITU
7
E/W PARABOL
8
UPPER E/W C

Figure: Geometry Alignments

Notes:

- Set an **external** pattern generator to a crosshatch video signal and connect the RF output to the aerial input of the TV. Set the amplitude at least 1 mV_rms (60 dBuV) and the frequency to 61.25 MHz. Use system NTSC M if possible, otherwise match the system of your generator with the received signal in the set. **Note:** Do **not** use the internal test pattern from the GEOMETRY menu!
- Use the default alignment settings, but set 'Brightness' to '32'.
- For wide screen models, set to 'wide screen' mode, for 'classic' models, set to '4:3'.
- After alignment, save the value(s) with the STORE command in the SAM main menu.

Service tip: When the set is equipped with a rotation coil, use this menu item to check its correct alignment. If alignment is not correct, go to the user MENU, choose FEAUTURES, and select ROTATION. With the use of a crosshatch test pattern, align it to a correct horizontal picture.

Alignment

No adjustments needed. Use the given default values:

Table: Geometry alignment (default values)

Item	27PT8302/37	26PW8402/37	32PT8302/37	30PW8402/37 30PW8502/37	34PW8402/37	34PW8502/37
VERT.SHIFT	0	0	0	0	0	0
VER.AMPL	-23	-10	8	-15	-8	0
VER.SCOR	19	5	12	6	6	6
VER.U_LIN	0	0	-3	0	0	0
VER.L_LIN	0	15	17	0	0	25
HOR.SHIFT	-70	-32	-69	-50	-42	-35
EW.WIDTH	-57	-15	-93	-45	-40	-2
EW_1	-50	-80	-100	-73	-80	-80
EW_2	-46	-41	-54	-37	-45	-41
EW_3	-25	-22	-10	-19	-25	-23
EW_4	-10	-5	30	-6	-9	-8
EW_5	0	0	50	0	0	0

EW_6	0	0	50	0	0	0
EW_7	-8	-5	35	-7	-7	-4
EW_8	-22	-16	-1	-22	-24	-18
EW_9	-48	-34	-52	-41	-49	-38
EW_10	-50	-38	-110	-76	-64	-64
HOR.BOW	2	2	4	2	3	0
HOR.PARALLEL	1	2	1	2	1	0
HOR.LIN	-12	9	-12	0	0	6
HOR.SCOR	-4	-3	0	0	0	0
HOR.IN_PIN	0	0	0	0	0	0

If the mentioned default values do not give the required result, use the following alignment method:

1. Before starting the vertical alignment, set (in SAM) the following parameters to '0':
   - VER. SHIFT,
   - VER. SCOR,
   - VER. U_LIN,
   - VER. L_LIN.
2. Set SERV. BLK to 'on', to blank the lower half of the screen.
3. Adjust the 'VERTICAL SHIFT' potentiometer (R3642 on the LSP) until the picture is centered (to the mechanical centre of the picture tube), and switch SERV. BLK to 'off'.
4. Adjust VER. U_LIN and VER. L_LIN such, that upper and lower horizontal lines of the crosshatch pattern are just visible.

Use then the following software regulations to modify the geometry:

1. VER. AMPL (Vertical Amplitude): Align for the vertical picture centre, range from -32 to +32.
2. VER. SHIFT (Vertical Shift): Compensating for any gain error in amplifier, adjust range from -32 to +32 to the proper amplitude.
3. VER. SCOR (Vertical S-Correction): Align for equal height of the blocks in the top, the bottom and the middle, range from -63 to +63.

4. HOR. SHIFT (Horizontal Shift): Adjust for the horizontal centre of the screen, range from -127 to +128.

Next step is to align the East/West geometry.

1. First, set the parameters EW_5 and EW_6 to '0'
2. EW. WIDTH (East-West Width): This sets the (overall) horizontal size of the picture on the screen. Range from -63 to +63 (with the following EW alignments, these lines can be straightened).
3. EW_1 (East-West parameter 1): Has effect on the length of the upper part of the vertical E/W lines.
4. EW_2 (East-West parameter 2): Has effect on the length of the vertical E/W lines just below EW_1.
5. EW_3 (East-West parameter 3): Has effect on the length of the vertical E/W lines just below EW_2.
6. EW_4 (East-West parameter 4): Has effect on the length of the vertical E/W lines just below EW_3.
7. EW_5 (East-West parameter 5): Has effect on the length of the vertical E/W lines just below EW_4.
8. EW_6 (East-West parameter 6): Has effect on the length of the vertical E/W lines just below EW_5.
9. EW_7 (East-West parameter 7): Has effect on the length of the vertical E/W lines just below EW_6.
10. EW_8 (East-West parameter 8): Has effect on the length of the vertical E/W lines just below EW_7.
11. EW_9 (East-West parameter 9): Has effect on the length of the vertical E/W lines just below EW_8.
12. EW_10 (East-West parameters 10): Has effect on the length of the lowest part of the vertical E/W lines.
13. HOR. BOW (Horizontal Bow): Align the EW parabola to be symmetrical, range from -63 to +63.

14. HOR. PARALLEL (Horizontal Parallel): Align for straight vertical lines on the picture sides, range from -63 to +63.

15. HOR. LIN (Horizontal Linearity): Align for equal width of horizontal blocks on the left, the right and the centre, range from 0 to +127.

16. HOR. IN_PIN (Horizontal Inner Pincushion): Align for the inner straight vertical lines, range from 0 to +32.

SOUND

No adjustments needed. Use the given default values:

- PRESCALE LEVEL
  - FM: '+1'.
  - EXTAM Gain: '0'.
  - PIPMONO: '0'.
  - ExtLR-in: '0'.
  - SAP: '0'.
- TRESHOLD LEVEL
  - Over Mod Tresh: '+3dB'.
  - NoiseTres SC2: '+2'.
  - NoiseHyst SC2: '+4'.
  - NoiseTres SAP: '+4'.
  - NoiseHyst SAP: '0'.
  - Nmute BTSC Hyst: '+7'.
  - Nmute BTSC Thr: '+4'.
- EFFECTS LEVEL
  - BMT CutOffFrq: '50Hz'.

- Incredible SND: '60%'.
- VDolby: '100%'.

SMART SETTINGS

No adjustments needed. Use the given default values (differs per selected source):

Table: Smart settings (default values)

Smart setting	RF-source	AV-source (480i, 480p)	HD-source (1080i)	
MOVIES	BGT	42	42	40
	COL	46	46	46
	CON	60	55	65
	SHP	3	3	3
	HUE	52	52	46
SPORTS	BGT	51	46	44
	COL	50	50	48
	CON	90	85	90
	SHP	5	5	5
	HUE	52	52	46
WEAK	BGT	46	44	42
	COL	46	46	46
	CON	75	70	75
	SHP	1	1	1
	HUE	52	52	46
MULTI	BGT	51	48	46
	COL	55	55	50
	CON	95	90	95
	SHP	6	6	6
	HUE	52	52	46
BGT= Brightness, COL= Color, CON= Contrast, SHP= Sharpness, HUE= Hue.				

OPTIONS

Introduction

The microprocessor communicates with a large number of I2C ICs in the set. To ensure good communication and to make digital diagnosis possible, the microprocessor has to know which ICs to address. The presence / absence of these specific ICs (or functions) is made known by the option codes.

Notes:

- After changing the option(s), leave the OPTIONS submenu, and save them with the STORE command.
- The set must be disconnected from AC power to change and store the option codes. If the television is only turned 'off' with the Power switch, the option code settings are NOT read by the microprocessor.
- When the EAROM is replaced, all options will require resetting. To be certain that the factory settings are reproduced exactly, you must set all option number lines. Normally, you can find the correct option numbers on the CRT sticker inside the TV set. If the CRT sticker is damaged or not present, you can use the options listed in the option code table below.

Example: The CRT sticker (or SAM menu) shows the following option numbers:

- OB1= 8331
- OB2= 225
- OB3= 913
- Etc.

Every number represents 16 bits (so the maximum number will be 65536 if all options are set to on).

When all the correct options are set, the sum of the decimal values of each Option Byte (OB) will give the option number.

Changing options

Options are used to control the presence / absence of certain features and hardware. There are two ways to change the option settings, which are explained below. Selecting STORE and pressing the CURSOR RIGHT key save all changes in the option settings. Some changes will only take affect after the set has been switched 'off' and 'on' with the mains switch (cold start).

Changing multiple options by changing option byte values

An option number (or 'option byte') represents a number of different options. When you change these numbers directly, you can set all options very quickly. All options are controlled via these option numbers.

- To change the option numbers, select the Option Byte you want to change with the CURSOR UP/DOWN keys, and key in the new value. See table 'Option bit overview' for more details. An explanation per option is listed in paragraph 'Option Bit Definition'.
- Changes to the option codes must be stored manually.

Table: Option byte settings

Option Byte/ [Note]	26PW8402/37 30PW8502/37	27PT8302/37 32PT8302/37	27MS5402/37	30PW8402/37 34PW8402/37	34PW8502/37
OB1 [1]	24715	08331	24715	24715	24715
OB2	00225				
OB3 [2]	00913	00657	00657	00913	00913
OB4	00129				
OB5	00064				
OB6	20480				
OB7	06720				
OB8 [3]	00005	00005	00005	00261	00261
OB9	24017				
OB10 [4]	03867	00795	03867	03867	03867
OB11	07309				
OB12	11008				
OB13	00704				

Notes:

[1] 24715 if subtitle shift = on

[2] 00657 aspect ratio = off

[3] 00005 if HDMI = off

[4] 00539 if SBNP = off; 02843 if heading shift = on; 00793 if SZAP = 0; 03867 if CZOM in on.

Changing a single option

It is also possible to change an option one at a time. Therefore, select the option with the CURSOR UP/DOWN keys and change its setting with the LEFT/RIGHT keys.

Table: Option bit settings

	26PW8402/37 **30PW8402/37** **34PW8402/37** **34PW8502/37**	**27PT8302/37** **32PT8302/37**	**27MS5402/37**	**30PW8502/37**
2CVI	ON			
HDMI	ON	OFF	ON	OFF
ASPR	ON	OFF	OFF	ON
EXCF	OFF			
DCMU	ON			
HIST	ON			
DCMU	ON			
DNR	ON			
HDSF	OFF			
CZOM	ON	OFF	ON	
HSHT	ON	OFF	ON	
SSHT	ON	OFF	ON	
APC	ON			
ROTI	ON			
ISMU	ON			
AAVL	ON			
SPKC	ON			
DBYV	ON			
EQTO	OFF			
BASF	DBE			
AOUT	ON			
HPMN	OFF			
QPEAK	OFF			
PITN	OFF			
FUNN	OFF			
USTN	ON			
SURF	ON			
SZAP	ON			
PLST	ON			
PIPC	OFF			
PIPT	OFF			
W4X3	OFF			
W169	OFF			
SMCK	ON			
TIME	ON			
CCAP	ON			
VCBK	ON			
VBNR	ON			
SOSD	ON			
BNUM	ON			
STOR	OFF			

SBNP	ON
AUSB	ON
HOSP	OFF
BBD	OFF

Option Bit Definition

Note: This chassis is global. Therefore all available options are listed below. It depends on the region which options are used in the set.

Sources

CVI: AV1 CVI source.

Function: Disabled/Enabled AV1 CVI source.

Values: OFF= Disabled, AV1 CVI source is not available. ON= Enabled, AV1 CVI source is available.

AV3: Side AV source.

Function: Disabled/Enabled side AV source.

Values: OFF= Disabled, side AV source is not available. ON= Enabled, side AV source is available.

SCT3: SCART 3 input.

Function: Disabled/Enabled SCART3 input.

Values: OFF= Disabled. ON= Enabled.

VGA: 2FH VGA input.

Function: Disabled/Enabled 2FH VGA input.

Values: OFF= Disabled. ON= Enabled.

2CVI: 2FH CVI input.

Function: Disabled/Enabled 2FH CVI input.

Values: OFF= Disabled. ON= Enabled.

HDMI: HDMI input.

Function: Disabled/Enabled HDMI input.

Values: OFF= Disabled. ON= Enabled.

Video

ASPR: Aspect Ratio Setting.

Function: Select between 4 by 3 or 16 by 9 set.

Values: OFF= 4 by 3 set. ON= 16 by 9 set.

VMUT: Video Mute.

Function: Disabled/Enabled video mute (blanking) during channel change.

Values: OFF= Disabled. ON= Enabled.

EXCF: External Comb Filter.

Function: To determine the availability of 3D comb filter on the SSB.

Values: OFF= Disabled, the 3D comb filter is not available. ON= Enabled, the 3D comb filter is available.

DCMU: Dynamic Contrast via Menu.

Function: Disabled/Enabled Dynamic Contrast menu item.

Values: OFF= Disabled, Dynamic Contrast menu item is not available. ON= Enabled, Dynamic Contrast menu item is available.

Note: Dynamic Contrast via RC should always work (for all region).

DNR: Dynamic Noise Reduction.

Function: Disable/Enable (Dynamic) Noise Reduction function.

Values: OFF=Disabled. ON= Enabled.

BBD: Black Bar Detection.

Function: Disable/Enable Black Bar Detection.

Values: OFF=Disabled, Black Bar Detection not available. ON= Enabled, Black Bar Detection available.

Note: The Auto Screen Fit will not be included in the picture size loop when BBD is OFF.

ASF: Auto Screen Fit.

Function: Disable/Enable Auto Screen Fit.

Values: OFF=Disabled, Auto Screen Fit is not available. ON= Enabled, Auto Screen is Fit available.

Note: This option is only applicable to A02E 2003 (EU Basic).

HDSF: High Definition Screen Fit.

Function: Disabled/Enabled High Definition Screen Fit.

Values: OFF=Disabled, High Definition Screen Fit is not available. ON= Enabled, High Definition Screen is Fit available.

CZOM: Continuous Zoom.

Function: Disable/Enable Continuous Zoom.

Values: OFF=Disabled. ON= Enabled.

HSHT: Heading Shift.

Function: Disable/Enable Heading Shift.

Values: OFF=Disabled. ON= Enabled.

SSHT: Subtitle Shift.

Function: Disable/Enable Subtitle Shift.

Values: OFF=Disabled. ON= Enabled.

APC: Auto Picture Control (Auto TV).

Function: Disable/Enable Auto picture control.

Values: OFF= Disabled. ON= Enabled.

WSSB: Wide Screen Signaling Bit.

Function: Disable/Enable Wide screen Signaling bit function.

Values: OFF= Disabled. ON= Enabled.

ROTI: Rotation Tilt.

Function: Change the tilt level of picture tube.

Values: OFF= Disabled, menu item ROTATION is not available. ON= Enabled, menu item ROTATION is available.

DGSC: Digital Scan.

Function: Enable/Disable the Digital Scan in the DIGITAL OPT menu.

Values: OFF= Disabled, menu item DIG SCAN is not available. ON= Enabled, menu item DIG SCAN is available.

SCAVM: SCAVEM.

Function: Enable/Disable SCAVEM.

Values: OFF= Disabled. ON= Enabled.

Audio

ISMU: Incredible Surround through Menu.

Function: Disabled/Enabled incredible stereo (through Menu) function.

Values: OFF= Disabled, menu item INCREDIBLE STEREO (through Menu) is not available. ON= Enabled, menu item INCREDIBLE STEREO (through Menu) available.

AAVL: Automatic Volume Level control.

Function: Disable/Enable automatic volume leveler function.

Values: OFF=Disabled, menu item AVL is not available. ON= Enabled, menu item AVL is available.

SPKC: Speaker Control.

Function: Disabled/Enabled internal speakers.

Values: OFF= Disabled, menu item SPEAKERS is not available. ON= Enabled, menu item SPEAKERS is available.

Note: SPEAKERS menu item is present in SOUND submenu when SPKC is ON.

DBYV: Dolby Virtual.

Function: Select surround setting.

Values: OFF= Disabled, DOLBY VIRTUAL setting is not available. ON= Enabled, DOLBY VIRTUAL setting is available.

Note: Incredible surround & Dolby virtual are mutually exclusive.

EQTO: Equalizer or Tone control.

Function: Selection between Equalizer and Tone control (Bass and Treble).

Values: OFF= Tone control (Bass and Treble). ON= Equalizer.

Note: Equalizer and Tone (Bass and treble) control are mutually exclusive.

BASF: Bass Feature.

Function: Select Dynamic (DBE) and Ultra Bass (DUB).

Values: 00= Disable DBE and DUB, 01= Enable DBE, 10= Enable DUB, 11= Not used.

AOUT: Audio Out.

Function: Disable/Enable menu item AUDIO OUT.

Values: OFF= Disabled, menu item AUDIO OUT is not available. ON= Enabled, menu item AUDIO OUT is available.

HPMN: Headphone Menu.

Function: Disable/Enable headphone menu.

Values: OFF= Disabled, Headphone submenu is not available. ON= Enabled, Headphone submenu is available.

QPEAK: AV Sound Mode detection.

Function: The current Sound Mode detection in AV is not working correctly. The optimal threshold value for the correct sound mode detection is still being investigated. Therefore, this is needed to disable the Sound Mode detection in AV until the correct threshold is identified.

Value: OFF= Disabled, AV sound auto detection is not available. ON= Enabled. AV sound auto detection is available.

SWOF: Subwoofer Selection.

Function: Disabled/Enabled Subwoofer.

Values: 00= Disabled, Subwoofer not available, 01= Enabled, Subwoofer is available, 10= Not Used, 11= Not used.

Note: This option is only for AP.

Tuning

PITN: Philips Tuner.

Function: Choose the tuner type that is configured in the hardware.

Values: 00= Disabled, ALPS compatible tuner is used. 01= Enabled, Philips compatible tuner is used, 10= Not Used, 11= Not Used.

CHNA: China.

Function: Set China Tuning IF Frequency.

Values: OFF= Disabled, Tuning is not for China TV set, ON= Enabled, Tuning is for China TV set.

Note: This option is also used to differentiate the AP China and AP Multi clusters. If CHNA is set to OFF, it is referring to AP Multi. If CHNA is ON, it is referring to AP China.

FUNN: Fine Tuning.

Function: Disabled/Enabled submenu, which allows fine-tuning of channel and storing the adjusted value.

Values: OFF= Disabled, menu item MANUAL is not available. ON= Enabled, menu item MANUAL is available

USTN: USA Tuning.

Function: Disabled/Enabled USA Tuning.

Values: OFF= Disabled. ON= Enabled.

Installation

ACI: Automatic Channel Installation.

Function: Disable/Enable automatic channel installation.

Values: OFF= Disabled Automatic Channel Installation. ON= Enabled Automatic Channel Installation.

Note: Download present program when ACI is ON.

ATS: Automatic Tuning System.

Function: Disable/Enable automatic tuning system.

Values: OFF= Disabled, automatic tuning system is ignored. ON= Enabled Automatic Tuning System, sort the program in an ascending order starting from Program 1.

Note: Sort the program in an ascending order starting from Program 1 when ATS is ON.

MALY: Malay Language.

Function: Disabled/Enabled Malay Language.

Values: OFF= Disabled. ON= Enabled.

VMOD: Virgin Mode.

Function: Disable/Enable virgin mode.

Values: OFF= Disabled, cannot access virgin mode. ON= Enabled, can access virgin mode.

Note: Plug and Play menu item will be displayed to perform installation at the initial start up of the TV when MOD is 'on' and after installation is done, VMOD will be automatically set to OFF.

UKPNP: UK Plug and Play.

Function: Disable/Enable UK's default Plug and Play setting.

Values: OFF= Disabled, UK's default Plug and Play setting is not available. ON= Enabled, UK's default Plug and Play setting is available.

Note: When UKPNP and VMOD are 'on' at the initial set-up, LANGUAGE= ENGLISH, COUNTRY= GREAT BRITAIN and after auto store is complete, VMOD will be set automatically to 'off' while UKPNP remain ON.

Program Selection

SURF: Surf.

Function: Disabled/Enabled surf feature.

Values: OFF= Disabled, Surf feature is not available. ON= Enabled, Surf feature is available.

SZAP: Smart Zapper.

Function: Disable/Enable Smart Zapper.

Values: OFF= Disabled. ON= Enabled.

PLST: Program List.

Function: Disable/Enable Program List function.

Values: OFF= Disabled, the access to Program List Command is ignored. ON= Enabled, the access to Program List Command is processed.

Picture In Picture

PIPC: PIP Control.

Function: Disable/Enable submenu to adjust PIP Picture settings

Values: OFF= Disabled, PIP feature is not available. ON= Enabled, PIP feature is available

Note: PIP is present in FEATURES submenu when PIPC is ON. When PIPC is switched OFF, bits PIPT, W4X3, and W169 must be automatically set to OFF.

PIPT: PIP Tuner.

Function: To determine the presence of second tuner.

Values: OFF= Disabled, second tuner is not available. ON= Enabled, second tuner is available.

Note: When PIPC is switched OFF, bits PIPT, W4X3, and W169 must be automatically set to OFF.

W4X3: DW 4:3

Function: Disabled/Enabled Double window with 4:3 Main Picture.

Values: OFF= Disabled, Double Window with 4:3 Main Picture is not available. ON= Enabled, Double Window with 4:3 Main Picture is available.

W169: DW 16:9.

Function: Disabled/Enabled Double Window two compressed 16:9 pictures.

Values: OFF= Disabled, Double Window with compressed 16:9 is not available. ON= Enabled, Double Window with compressed 16:9 is available.

Clock

SMCK: Smart Clock/Autochron.

Function: Disable/Enable smart clock/AutoChron function.

Values: OFF= Disabled, menu item smart clock function not available. ON= Enabled, menu item smart clock function available.

Note: For NAFTA, AUTOCHRON is present in INSTALL submenu when SMCK is ON. For AP-PAL and EUROPE, Smart clock downloaded from Teletext is enabled when SMCK is ON.

NVCK: Non-Volatile Clock.

Function: Disabled/Enabled Non Volatile Clock function.

Values: OFF= Disabled, non-volatile clock not available. ON= Enabled, non-volatile clock is available.

TIME: Timer.

Function: Disable/Enable menu item TIMER.

Values: OFF= Disabled, menu item TIMER not available. ON= Enabled, menu item TIMER available.

Note: TIMER submenu is present in FEATURES submenu when TIME is ON.

Data Service

CCAP: Closed Caption.

Function: Disabled/Enabled a submenu to set the Caption mode or Text mode, and to enable/disable CC display.

Values: OFF= Disabled menu item CLOSE CAP is not available. ON= Enabled menu item CLOSE CAP. Available.

Note: CLOSED CAP is present in FEATURES submenu when CCAP is ON.

CTXT: Caption Text.

Function: Disabled/Enabled Text mode setting.

Values: OFF= Disabled, TEXT mode settings are not available. ON= Enabled, TEXT mode settings are available.

Note: TEXT mode settings (TEXT 1 to TEXT 4) are present in CAPTION MODE menu item in the CLOSE CAP submenu when CTXT is ON.

DTXT: Dual Text.

Function: Disable/Enable Dual Text.

Values: OFF= Disabled. Dual text is not available. ON= Enabled. Dual text is available.

VTXT: Video Text.

Function: Disabled/Enabled Video Text.

Values: OFF= Disabled, Videotext is not available. ON= Enabled, Videotext is available.

RCMX: RC for Teletext Mix Mode.

Function: Disable/Enable RC for Teletext Mix mode support.

Values: OFF= Disabled. RC for mix mode is not available. ON= Enabled, RC for mix mode is available.

FAPG: Favorite Page.

Function: Disable/Enable favorite page in Teletext mode.

Values: OFF= Disabled favorite page in Teletext mode. ON= Enabled favorite page in Teletext mode.

T1H0: 100-Page Text.

Function: Disable/Enable 100-page Text.

Values: OFF= Disabled. 100-page text is not available. ON= Enabled, 100-page text is available.

T2H5: 250-Page Text.

Function: Disable/Enable 250-page Text.

Values: OFF= Disabled. 250-page text is not available. ON= Enabled, 250-page text is available.

T12H: 1200-Page Text.

Function: Disable/Enable 1200-page Text.

Values: OFF= Disabled. 1200-page text is not available. ON= Enabled, 1200-page text is available.

Lock Features

CHLK: Child Lock.

Function: Disable / Enabled function to block/unblock channels.

Values: OFF= Disabled. ON= Enabled.

Note: This option is applicable to EU and AP.

AULK: Auto Lock.

Function: Disabled/Enabled Auto Lock.

Values: OFF= Disabled, AUTOLOCK is not available (CHILDLOCK is used). ON= Enabled, AUTOLOCK is available i.s.o. CHILDLOCK.

VCBK: Vchip Block Unrated.

Function: Disabled/Enabled menu item BLOCK UNRATED.

Values: OFF= Disabled, menu item BLOCK UNRATED not available. ON= Enabled, menu item BLOCK UNRATED available

Note: For NAFTA and LATAM, VCHP must be 'on' to enable BLOCK UNRATED.

Note: BLOCK UNRATED is present in AUTOLOCK / BLOCKED OPTION submenu when VCBK is ON.

Note: BLOCK UNRATED is present in AUTOLOCK REVIEW screen when VCBK is ON.

VBNR: Vchip Block No Rating.

Function: Disabled/Enabled menu item BLOCK NO RATING.

Values: OFF= Disabled, menu item BLOCK NO RATING not available. ON= Enabled, menu item BLOCK NO RATING available.

Note: For NAFTA and LATAM, VCHP must be 'on' to enable NO RATING.

Note: NO RATING is present in AUTOLOCK / BLOCKED OPTION submenu when VBNR is ON.

Note: NO RATING is present in AUTOLOCK REVIEW screen when VBNR is ON.

OSD/Menu Related

SOSD: Smart OSD.

Function: Disable/Enable full display of SMART SOUND and SMART PICTURE OSD.

Values: OFF= Disabled, full display of SMART SOUND and SMART PICTURE OSD not available. ON= Enabled, full display of SMART SOUND and SMART PICTURE OSD available.

BNUM: Bar Numeric Items.

Function: Disabled/Enabled the numerical values to be displayed beside the slider bar.

Values: OFF= Disabled, the numerical values is not display beside the slider bar. ON= Enabled, the numerical values is display beside the slider bar.

STOR: Store.

Function: Store Picture and Sound settings.

Values: OFF= Disabled, menu item STORE is not available. ON= Enabled, menu item STORE is available.

Note: STORE is present in PICTURE and SOUND submenu when STOR is ON.

APCL: Active Control Logo Display.

Function: Enable/Disable the selection of Display logo in the sequence when Active Control key is pressed.

Values: OFF= Disabled, the sequence for Active Control (with wrap around) is Off -> On -> Display On. ON= Enabled, the sequence for Active Control (with wrap around) is Off -> On -> Display On -> Display Logo.

Miscellaneous

SBNP: Auto Standby with No Picture.

Function: Disable/Enable automatic switch to standby after 15 minutes when no ident.

Values: OFF= Disabled, no automatic switch to standby. ON= Enabled, set switches to standby after 15 minutes when no ident.

AUSB: Auto Standby Auto On.

Function: Disable/Enable automatic switch to standby if no RC or local keyboard response after 4 hours provided that the set is 'on' from standby mode by the timer.

Values: OFF= Disabled, no automatic switch to standby. ON= Enabled, set switches to standby after 4 hours.

EPG: Electronic Program Guide.

Function: Disable/Enable EPG feature.

Values: OFF= Disabled, EPG feature is not available. ON= Enabled, EPG feature is available.

P50: P50 (Easylink).

Function: Disable/Enable P50 feature.

Values: OFF= Disabled, P50 feature not available. ON= Enabled, P50 feature is available.

HOSP: Hospitality.

Function: Disabled/Enabled hospitality mode.

Values: OFF= Disabled, hospitality mode is disabled. ON= Enabled, hospitality mode is enabled.

Region

TWKE: Taiwan/Korea.

Function: Select between Taiwan and Korea.

Values: OFF= Korea. ON= Taiwan

MIDE: Middle East.

Function: Select Middle East region.

Values: OFF= Non-Middle East. ON= Middle East

Note: This option is also used to differentiate the AP PAL (2AP1) and AP Middle-east (2AP2) clusters. If MIDE is set to OFF, it is referring to 2AP1 cluster. If MIDE is ON, it is referring to 2AP2 Cluster.

EWEU: East/West Europe region.

Function: This option is used to allow the development team to trigger the NVM initialization process during the development phase.

Values: OFF= Pressing the Freeze key in the Aux mode will NOT change the password of the NVM. ON= Pressing the Freeze key in the Aux mode will change the password of the NVM. The NVM will be re-initialized with the default values when the TV is wakeup from standby.

Note: This option is only applicable A02E 2003

Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter:

1. Introduction
2. Block diagrams
3. Power supply
4. HDMI
5. Video
6. Synchronization
7. Audio
8. Control
9. Protections
10. Software upgrading
11. Abbreviation list

- As this is a global chassis, the circuit descriptions are meant for all regions. Where necessary, a split up is made per region.
- Only **new** circuits (circuits that are not published recently) are described.
- For the 'known' LSP circuits, see the R8 (NAFTA) or EM5 (EU & AP) chassis manual.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the diagrams in chapter 6 and 7. Where necessary, you will find a separate drawing for clarification.

Introduction

The A02 is intended as the Mainstream TV platform for the years 2003 and 2004 and successor to the A10. Covering three ranges (Digital Ready, Digital Prepared, and Digital Integrated) with screen sizes of 28 inch WS to 36 inch WS RF (16:9) and 29 inch to 38 inch RF (4:3). The platform supports 50 Hz, 100 Hz, and progressive scan.
It is based on the SALSA system (System Application for Lower Segment Analog television), which is a highly integrated solution for TV. The system comprises two ICs: the ADOC (Analog Digital One Chip) and the MPIF (Multi Platform InterFace). The MPIF IC performs analog processing for IF, source selection, and analog to digital conversion. The ADOC IC incorporates video and audio processing as well as the complete TV control functionality. The ADOC aims at the low and mid range market segment.
As one of the first Philips chassis, it is equipped with a HDMI (High Definition Multimedia

Interface) connector, for interfacing (HD) digital audio and video sources.

The split-up between an analog (MPIF) and a digital part (ADOC) has the following advantages:

- High frequent parts (IF) can be included in the concept.
- Less A/D and D/A converters needed for source switching.
- Better performance for AD converters (realized in analog design environment, more accurate, less tolerance).
- Critical items like reference voltages can be realized in the analog environment.
- Integrated SCART buffers.

The new A02 chassis has the following features:

- An LSP (Large Signal Panel) that is based on the existing R8 chassis.
- A new SSB (Small Signal Board) with very high integration.
- Upgradeable main software (via ComPair). The software is a large and re-engineered version of the 'MG' software used by Philips CE for several years.

Large Signal Panel

The chassis has a full sized LSP, which is identical to the one in the R8 chassis.

The main functionalities of the LSP are:

- Supply,
- Deflection,
- Sound amplification.

The LSP (single sided) is built up very conventional, with hardly any surface mounted components on the copper side. It has a large 'hot' part, including both deflection coils.

Small Signal Board

The SSB is a high tech module (four layer, 2 sides reflow technology, full SMC) with very high component density. Despite this, it is designed in such a way, that repair on component level is possible. To achieve this, attention was paid to:

- Accessibility of the test points. The SSB has good accessible service positions.
- Clearance around surface mounted ICs (for replacing).

- Detailed diagnostics and fault finding is possible via ComPair.
- Software upgrading is possible via ComPair.

The main functionalities of the SSB are:

- Tuner input,
- I/O interface provisions,
- TXT and Control,
- Video and Audio decoding,
- Feature Box,
- Sync and Geometry control.

Further features of the SSB are:

- The PIP functionality (when present) is integrated on the SSB.
- The 3D Comb filter functionality (for USA) is integrated on the SSB.

On the photographs you can see where the key components are located on the SSB (Note: The actual PWB can differ from these photographs. They are only meant to give a general overview):

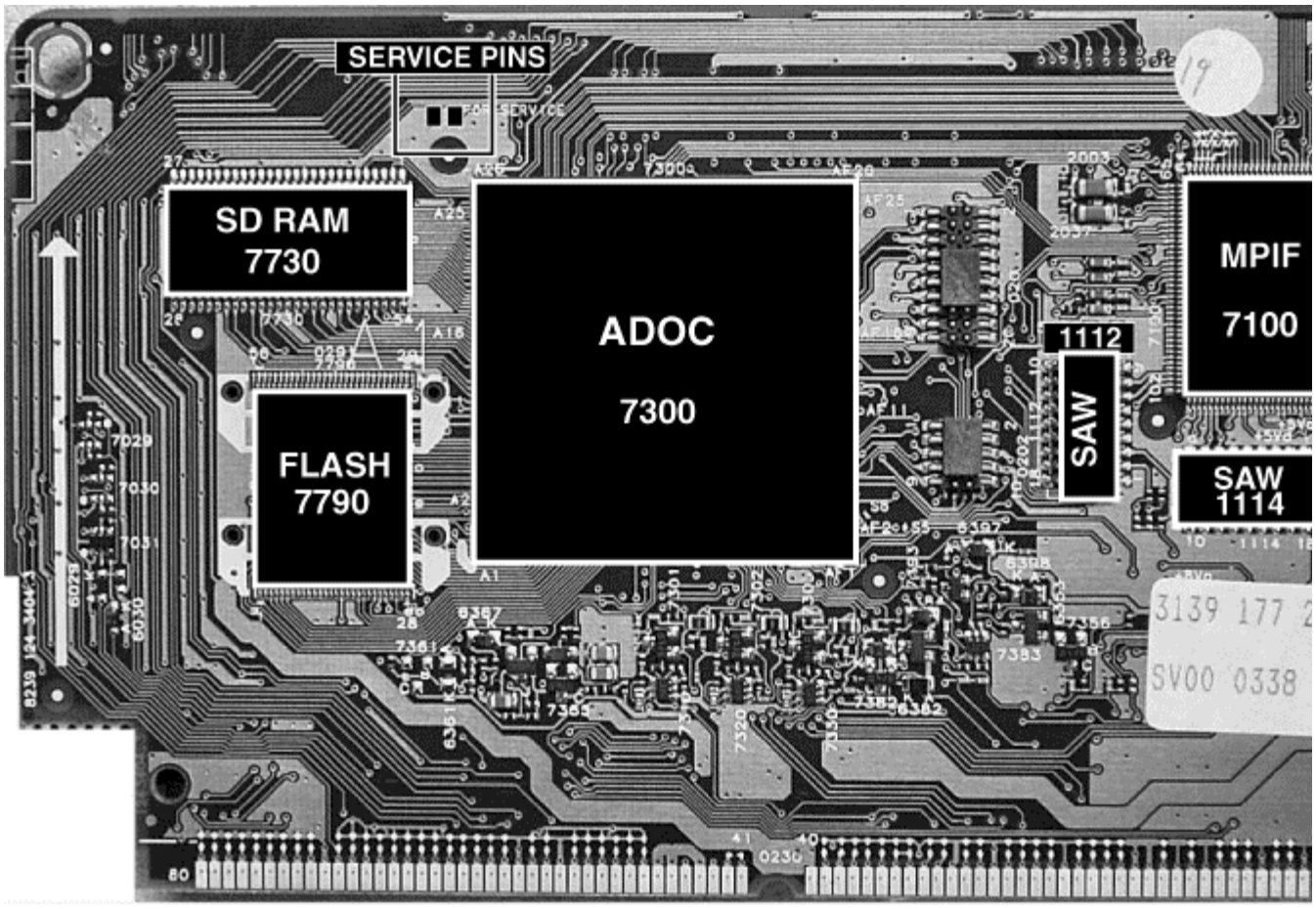


Figure: SSB top view (tuner side)

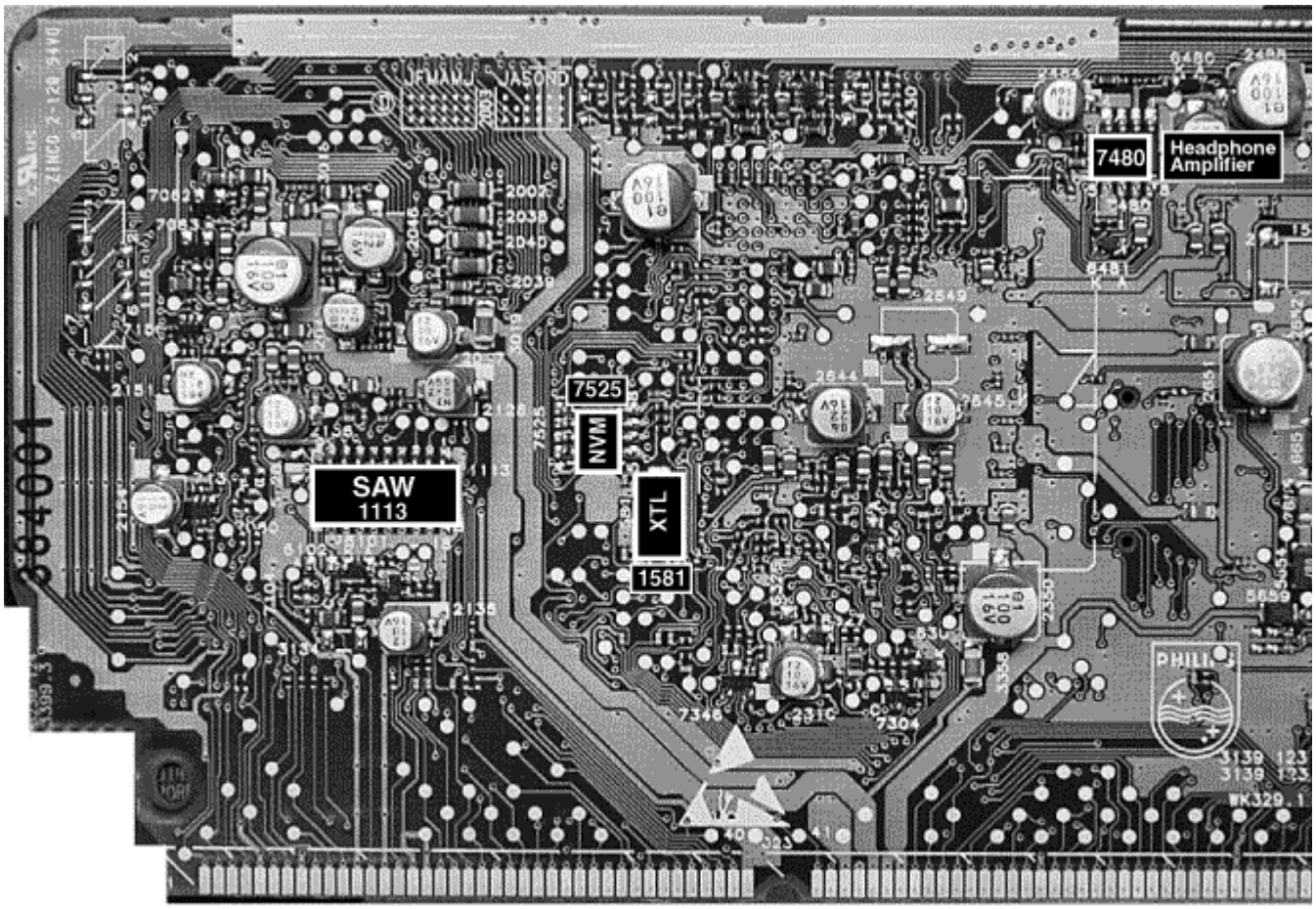


Figure: SSB bottom view (LOT side)

Block Diagrams

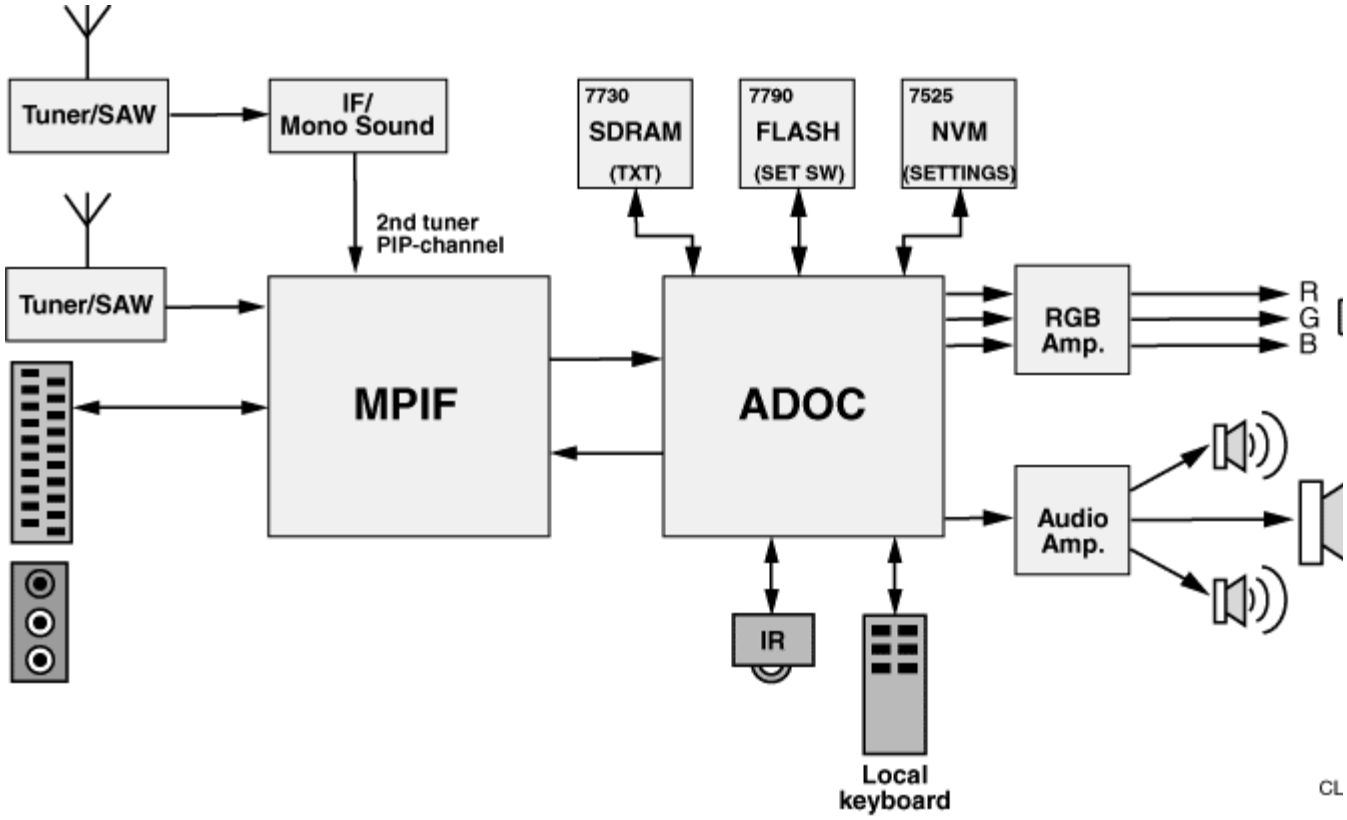


Figure: Chassis block diagram

The tuner is a PLL tuner and delivers the IF-signal, via a SAW-filter, to the MPIF IC (Multi Platform InterFace). This is an analog video and audio pre-processing unit for the ADOC TV processor. It contains the high frequent IF part and all the analog video and audio source switching for external in- and outputs. The MPIF can handle CVBS, Y/C, RGB (1fH/2fH) and YPbPr (1fH/2fH) video signals as well as stereo, I2S, and second sound IF audio signals. The MPIF converts the selected video and audio streams from the analog to the digital domain. Via three high-speed serial data links (I2D), the digitized audio and video signals are streamed to the ADOC IC for further processing.

The ADOC (Analog Digital One Chip) is a fully integrated, digitally implemented TV processor for audio, video, VBI (Vertical Blanking Interval) services, graphics, and control. It is a global, multi-standard system primarily designed for the reception and processing of analog broadcast signals.
Internal video processing is done in the ADOC with YUV-signals. It also handles the video control, geometry part, and the insertion of the TXT/CC/OSD RGB-signals. The video part delivers the RGB signals to the CRT-panel and the geometry part delivers the H-drive, V-drive (differential output), and E/W-drive.
An integrated MIPS 1910 processor runs the chassis software and takes care of the set control, error generation TXT/CC/OSD input-, and output processing. The NVM (Non Volatile

Memory) is used to store the settings, the Flash-RAM contains the set software, and the SDRAM stores the Teletext pages (in some versions, this is stored in the internal memory of the ADOC).

Both deflection circuits are located on the LSP and are driven by the ADOC. The horizontal output stage generates also some supply voltages and the EHT-, focus- and Vg2-voltages.

The RGB amplifiers on the CRT-panel are integrated in one IC and are supplied with 200 V from the LOT. The SCAVEM circuit modulates transitions of the Luminance (Y) signal on the horizontal deflection current, giving a sharper picture.

Sound IF processing, audio source selection, and audio analog-digital signal conversions are done in the MPIF IC. The ADOC contains a digital TV sound processor for analog and digital multi-channel sound systems in TV sets. By hardware programming, several applications can be scaled.
The audio output stage is built around a balanced amplifier, and is located on the LSP. It uses a monolithic integrated power amplifier IC, the TDA7497. The gain of the amplifier is constant. This means that volume control is done via the ADOC.

There is a separate Standby Supply, in order to reduce the Standby power consumption. During Standby, the Main Supply is switched 'off' (via TS7529).
A relay (1550) is used to switch the Degaussing circuit. It is switched 'on' after set start-up and switched 'off' by the microprocessor after 12 s.
The Main Supply, a SMPS based on the 'boost converter' principle, generates the 140 V (V_BAT) and the +/- 28 V for the audio part.

Power Supply

Introduction

The power supply circuitry is located on the large signal PWB, together with the audio amplifier and the deflection. It comprises of:

- Mains entrance with fuse.
- Separate standby -supply.
- Mains harmonic circuit.
- Mains rectifier.
- Main-supply: is able to deliver a continuous power between 100 W and 160 W.
- Degaussing.

For a detailed circuit description, see the R8 (NAFTA) or EM5 (EU & AP) Service Manual.

Power Supply architecture

The A02 SSB is supplied by +5V, +5.2V, +3.3V and +8V supply lines from the LSP. The SSB contains:

- A DC/DC converter which steps down +5.2V to +1V8,
- A switch to cut off the 3V3 supply to the 3D Comb in 'Standby' mode, and
- A regulator to generate the 2V5.

When the set is in 'Power STANDBY' mode, the +5.2V, +3.3V supply lines are present. Consequently, only the ADOC IC (+3V3 and +1V8), the SDRAM (+3V3), the Flash memory (+3V3), and the NVM memory (+3V3) are supplied. Other than NVM, all the other devices are powered down in 'Standby' mode. See section below for more details on the power modes.

OFF Mode

The set is completely switched 'off' from the mains. This is done with the mains switch for Europe and AP (for NAFTA it would mean disconnecting the TV from the mains by pulling out the mains cable). Depending upon the last Standby Status (stored in NVM), this mode can transit to 'on' mode or 'STANDBY' mode.
The transition timing for a Cold start from 'off' state to 'on' shall be such that from the instance the ADOC gets a hard reset, within 3 seconds one will hear the audio and within 7 seconds one will see the picture.

ON Mode

This is the normal operating mode. All the power supply lines on the A02 SSB and LSP are available. All the circuits in the set are active. From this mode, it is possible to transit to 'STANDBY', "SEMI-STANDBY', 'PROTECTION', or 'OFF' mode.

STANDBY Mode

The total power consumption of the TV set in this mode is equal or less than 1 W. The LED will indicate the Standby state. In this state only the ADOC, SDRAM, Program Memory, NVM, and all means to wake-up the set are powered. Rest of the A02 sub-systems is disconnected. A STANDBY control port controls this.
The transition timing from 'STANDBY' to 'ON' state is such that within 3 seconds, one will hear the audio and within 7 seconds, one will see the picture. From this mode, it is possible to transit to 'ON', 'SEMI-STANDBY', or 'OFF' mode.

SEMI-STANDBY Mode

All the circuits in the set (ADOC, MPIF, etc), except the Audio output, Deflection, and hence CRT display, are powered up and fully active. The Audio Mute is activated. The set, however, will appear to behave and to look like 'STANDBY' mode to the user. The user is totally oblivious of the existence of this mode.
The status of the power supply lines and the estimated total power consumption of the SSB are the same as 'ON' mode.
In this mode, the ADOC ICs horizontal deflection drive output is disabled, while the STANDBY control port is disabled. This consequently causes the LOT stage on the LSP to be inactive (although V_batt voltage is present) that, in turn, will cause the EHT to be cut off. This in turn will cause the CRT display to be inactive.
From this mode, it is possible to transit to 'ON' mode, 'STANDBY' mode, 'PROTECTION' mode or 'OFF' mode.

PROTECTION Mode

Power profile for protection mode is as low as required to allow 'soft' diagnostics, error detection, and to indicate LED flashes to flag the type of fault. The horizontal deflection is 'off' in this mode. From the protection mode, the only possible transition is to 'OFF' mode.

Start Up Sequence

1. When we start the set (cold start), initially 5V2, 3V3, and 1V8 will be available. These come from the Standby module of the power supply.
2. After this, the microprocessor resets (tied to 1V8 and 3V3 supplies) and checks the last status of the supply from the NVM. Accordingly, the set will be put in 'STANDBY' or in the normal 'on' condition.
3. Now, 5V and 8V are available if the last status was 'on' condition, and the DOP is initialized by the microcontroller through the PI bus (not via the I2C).
4. The H-drive will become available from the DOP, which is the source for the 'SUP_ENABLE' signal.
5. Via the 'SUP-ENABLE' signal, the Main Supply is switched 'on' and will deliver the V_BAT to the Line deflection stage.
6. EHT generation is now started.
7. The uP will un-blank the picture.
8. When you switch 'off' the set, this is done in a controlled way via the POR (Power On Reset) signal.

Note: Standby is controlled by the STANDBY Line of the uP (not by the DOP).

Shut Down Sequence

This section describes the processes that need to be handled by hardware and software when power is disconnected from the set.
Some system requirements:

- To handle CRT discharge.
- To handle 'switch off' plops.
- To prevent NVM corruption at switch 'off'.
- To effectively distinguish between the condition of mains interruptions and shutdown and handle them properly.
- The 'power down' detection is acquired from the deflection supply (+11V) and the level is translated to +3.3V (this event has the highest interrupt priority to trigger SW shutdown procedure).
- Power down detection is fed to the FBCIN input, initiates a slow stop, and hence ensures CRT discharge (it is important that the slow-stop is maintained for at least 50 ms to assist good discharge).
- The microcontroller, hence the system, shall have a clean power 'on' and power 'off' reset with respect to its supply. The microcontroller shall not be operational when the supply voltage is below the recommended limits. The transition between active and reset is fast.
- The microcontroller 'off' reset must occur much later (> 45 ms) than the POWER DOWN signal (P.DN).

When the POWER DOWN interrupt occurs, there is no way of knowing whether it is due to Medium Mains Interruptions or due to shutdown. Hence, there is no choice but to initiate shutdown procedure as described further below. The definition of Mains Interruption is given below:

- **Short Mains Interruptions.** Duration of the interrupts <= 55 ms. The set shall continue to work properly. The 'power off' acquisition circuit shall filter such events.
- **Medium Mains Interruptions.** Interruptions are of the order 70 to 80 ms. This is a typical situation when the 'power off' acquisition circuit, signals that the power is going down but the microcontroller does not get a reset. In this condition, a POWER DOWN signal is generated but no POWER OFF RESET signal is available.
- **Long Mains Interruption or Shutdown.** Any interrupt above 80 ms shall cause a microcontroller reset and hence a cold start. This happens, when the power is disconnected long enough to get a 'Power Off Reset' as well as the microcontroller reset. After this situation, the system would automatically cold start when the power resumes.

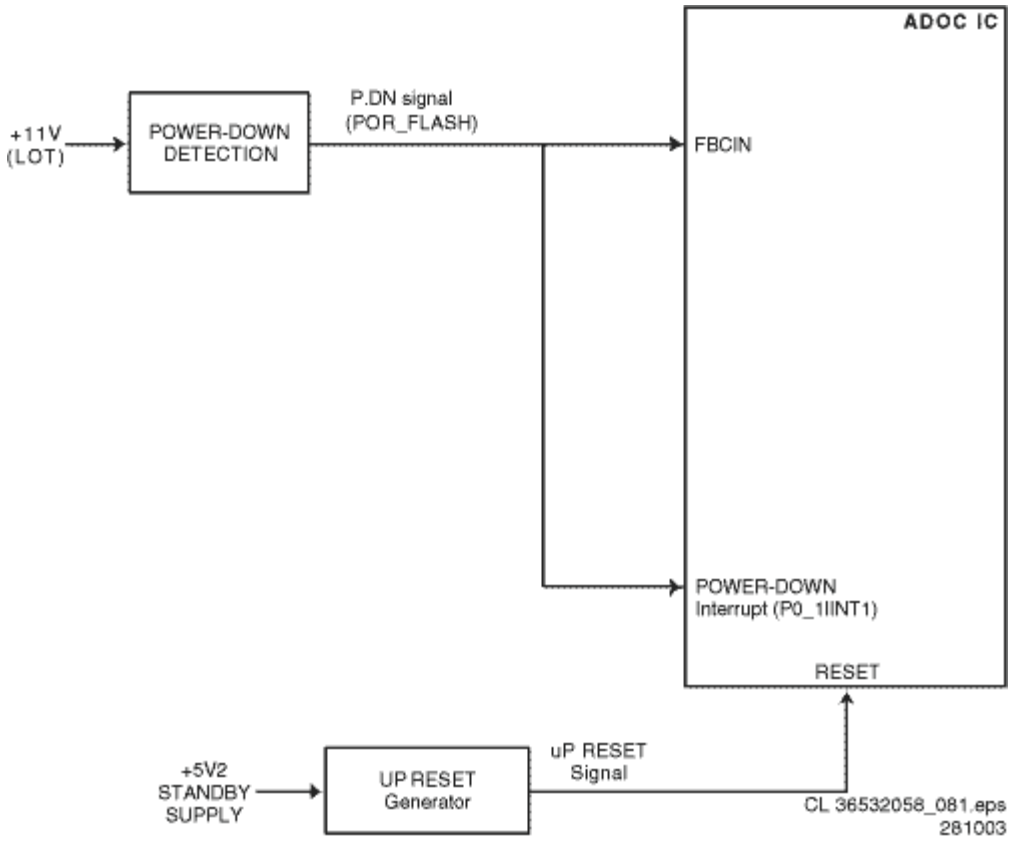


Figure: Shut down block diagram

Shutdown Procedure

1. Exclude all processes and do not respond to any interrupts - including RC events. However, during the following defined conditions of stopping the deflection (DFL-bit= 0), ignore the P.DN interrupt and rest of the procedure:
   - The system switched from ON to Standby by the user.
   - Protection event that forces the H-Deflection to stop.
   - Any other SW controlled event that causes the deflection to stop.
2. Since the P.DN signal is connected to FBCIN input, the DOP shall slow stop immediately - no software intervention is required. The precondition for this is that the FBDM bit in DOP is set to '1'. The slow -stop process will continue for the next 40 ms or so.
3. Mute Audio Output / Sound Enable line.
4. Mute audio external outputs (in ADOC).
5. Set the DFL-bit to '0', such that deflection shall not restart after the slow -stop process is done.
6. Disable NVM access. Do the following:
   - Put the NVM in standby state to stop I2C write to NVM, by sending the Universal Reset Sequence.

- Set Write Enable high: this avoids any further Write sequence to the NVM.

7. Disable all the I2C hardware communication.
8. Wait for 200 ms and execute a cold start when there is no microcontroller-reset signal. This is considered as 'medium mains interruption'.
9. After the cold start, the set should resume to the last status of user settings.

HDMI

Introduction

Note: Text below is an summary from the'HDMI Specification' that is issued by the HDMI founders (see *http://www.hdmi.org*).

The High-Definition Multimedia Interface is developed for transmitting digital television audiovisual signals from DVD players, set-top boxes and other audiovisual sources to television sets, projectors and other video displays.
HDMI can carry high quality multi-channel audio data and can carry all standard and high-definition consumer electronics video formats. Content protection technology is available. HDMI can also carry control and status information in both directions.

As shown in the HDMI block diagram, the HDMI connector carries four differential pairs that make up the TMDS (Transition Minimized Differential Signaling) data and clock channels. These channels are used to carry video, audio, and auxiliary data. In addition, HDMI carries a VESA DDC channel. The DDC is used for configuration and status exchange between a single Source device and a single Sink device.

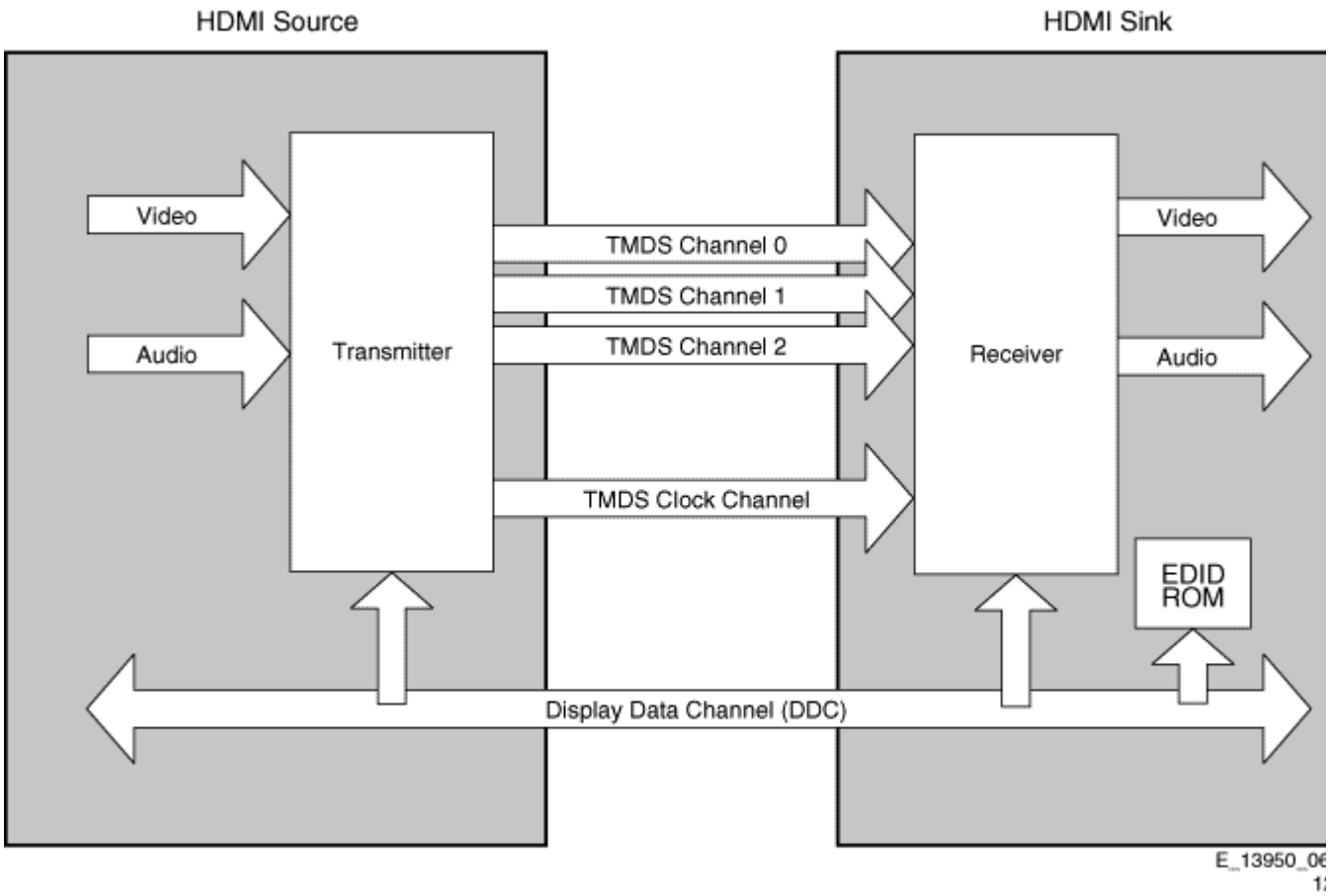


Figure: HDMI block diagram

Audio, video, and auxiliary data is transmitted across the three TMDS data channels. The video pixel clock is transmitted on the TMDS clock channel and is used by the receiver as a frequency reference for data recovery on the three TMDS data channels.
Video data is carried as a series of 24-bit pixels on the three TMDS data channels. TMDS encoding, converts the 8 bits per channel into the 10 bit DC-balanced transition minimized sequence, which is then transmitted serially across the pair at a rate of 10 bits per pixel clock period.
Video pixel rates can range from 25 MHz to 165 MHz. Video formats with rates below 25 MHz (e.g. 13.5 MHz for 480i/NTSC) can be transmitted using a pixel-repetition scheme. The video pixels can be encoded in either RGB, YCBCR 4:4:4, or YCBCR 4:2:2 formats. In all three cases, up to 24 bits per pixel can be transferred.
In order to transmit audio and auxiliary data across the TMDS channels, HDMI uses a packet structure. In order to attain the higher reliability required of audio and control data, this data is protected with a BCH error correction code and is encoded using a special error reduction coding to produce the 10-bit word that is transmitted.
Basic audio functionality consists of a single IEC 60958 audio stream at sample rates of 32

kHz, 44.1 kHz or 48 kHz. This can accommodate any normal stereo stream. Optionally, HDMI can carry a single such stream at sample rates up to 192 kHz or from two to four such streams (3 to 8 audio channels) at sample rates up to 96 kHz. HDMI can also carry IEC 61937 compressed (e.g. surround-sound) stream at sample rates up to 192 kHz.
The DDC is used by the Source to read the Sink's Enhanced Extended Display Identification Data (E-EDID) in order to discover the Sink's configuration and/or capabilities.

Implementation

HDMI input signals are fed to the HDMI Panellink Receiver (item 7002 on diagram M1). This IC consists of a flexible audio and video interface.
The video part delivers RGB/YPbPr output, that directly is fed to the MPIF source selector on the SSB (The IC is also capable of RGB input, assuring backwards compatability with DVI).
The audio part delivers a 2-channel I2S digital audio signal that is fed to the audio DAC (item 7011). After DA conversion the signals are also fed to the MPIF source selector.

Video

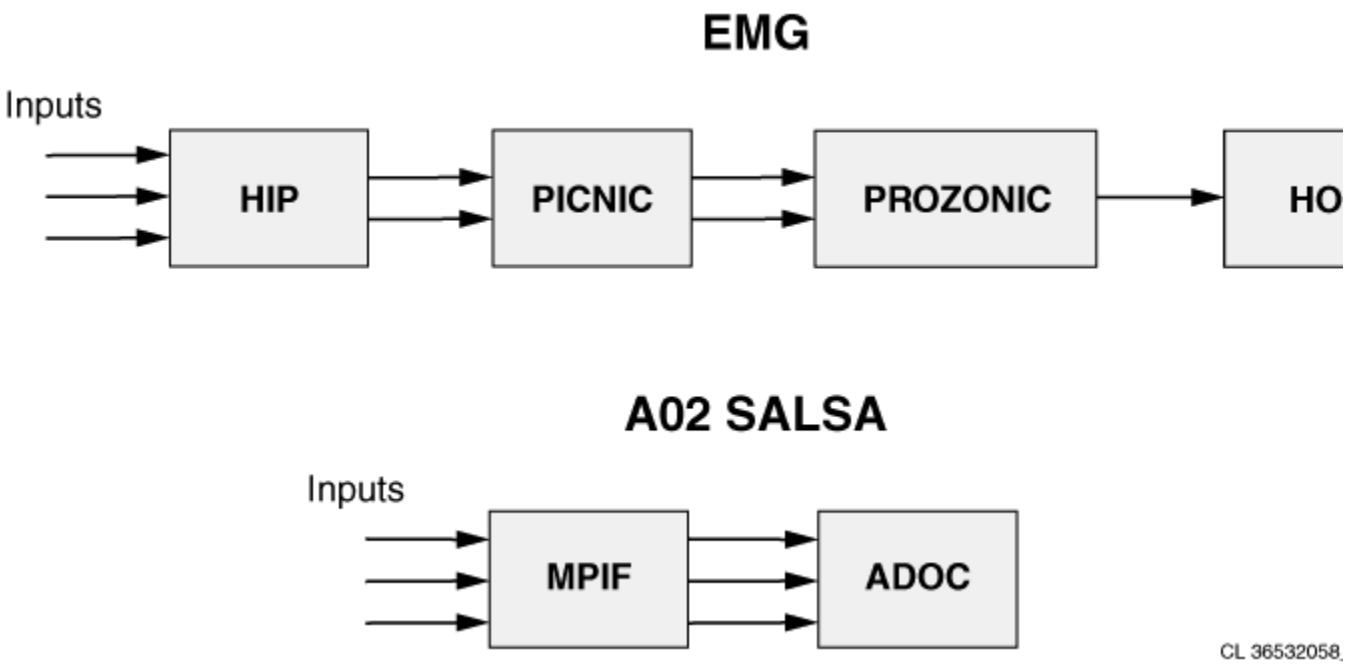


Figure: Signal processing A02- versus EMG-chassis.

The SALSA video processing part is a highly integrated solution. It comprises only two ICs, the ADOC (Analog Digital One Chip) and the MPIF (Multi Platform InterFace), while in the R8-

chassis, this was handled by four ICs (HIP, PICNIC, PROZONIC, and HOP).
The MPIF uses a nominal 8 V and 5 V supply, while the ADOC requires nominal supplies of 1.8 V and 3.3 V.

The video processing of the SALSA system can be spilt into six parts:

- Initial source selection and analog to digital conversion performed by MPIF.
- Demodulator (VIDDEC) performed by the ADOC.
- Front End Features (FEF) performed by the ADOC.
- Memory Based Features (MBF) performed by the ADOC.
- Back End Features (BEF) performed by the ADOC.
- Digital Output Processing (DOP) performed by the ADOC.

MPIF Analog Frond End

Introduction

The MPIF (Multi Platform InterFace, type number PNX3000, item number 7100) is an analog video and audio pre-processing unit for the ADOC TV processor. It contains the high frequent IF part and all the analog video and audio source switching for external in- and outputs. The MPIF can handle CVBS, Y/C, RGB (1fH/2fH) and YPbPr (1fH/2fH) video signals as well as stereo, I2S, and second sound IF audio signals. The MPIF converts the selected video and audio streams from the analog to the digital domain. Via three high-speed serial data links (I2D), the digitized audio and video signals are streamed to the ADOC IC for further processing. Following figure shows the MPIF block diagram.

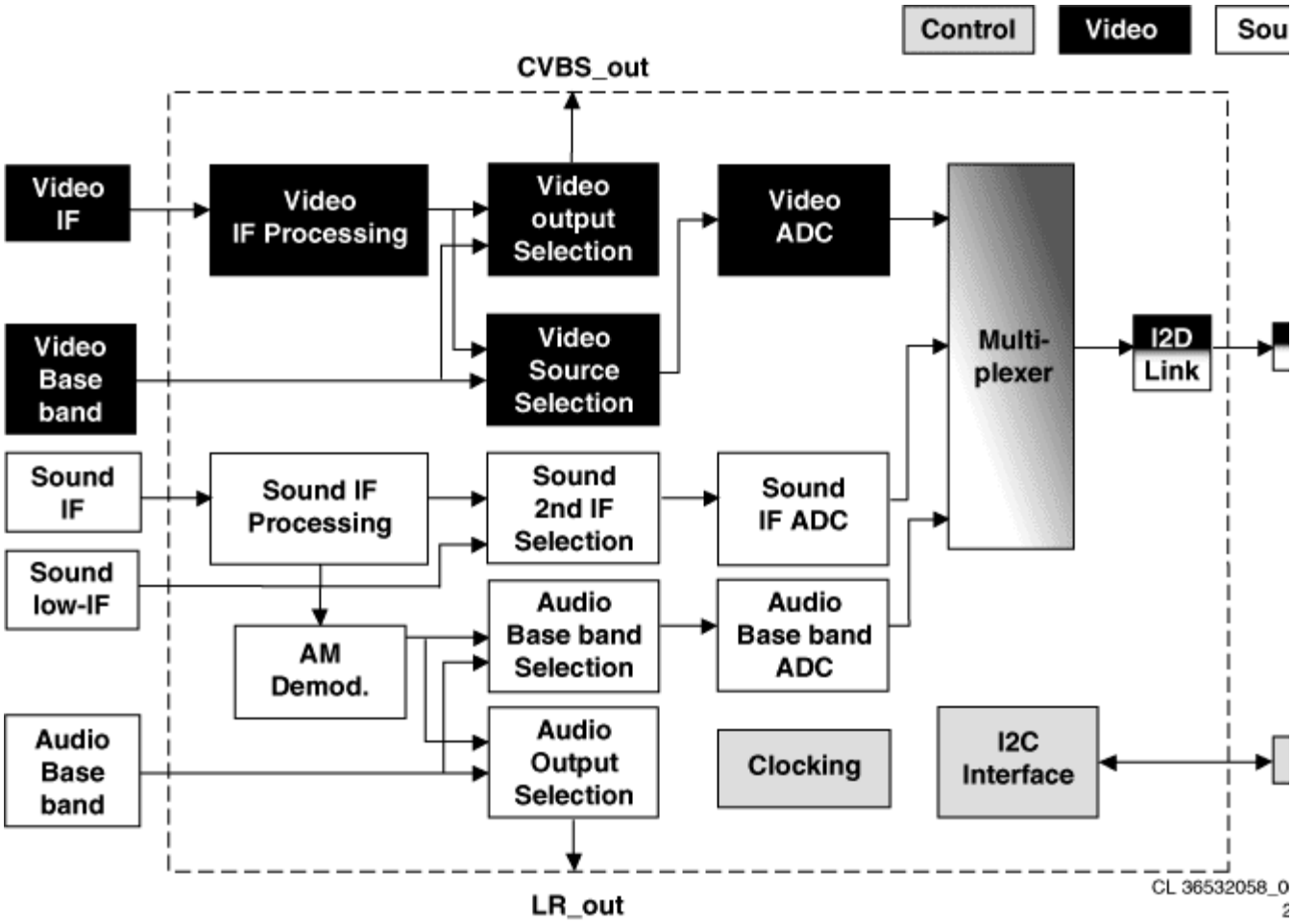


Figure: MPIF block diagram

Some MPIF features:

- IF Processing:
  - Amplifier, AGC.
  - Down mixer to base band.
  - Sound trap, low pass filter.
- Video base band switching:
  - CVBS, Y/C.
  - RGB, YPbPr (1fH/2fH).
- Audio base band switching.
- Video and audio A/D conversion.
- I2D formatter:
  - Data transfer to ADOC.

Vision IF

The video signal is demodulated by means of an alignment-free PLL carrier regenerator with an internal VCO. This VCO is calibrated by means of a digital control circuit, which uses an external crystal frequency as reference. The frequency setting for the various standards (33.4, 33.9, 38.0, 38.9, 45.75 and 58.75 MHz) is realized via the I2C bus.
The AFC output is generated by the digital control circuit of the IF-PLL demodulator and can be read via the I2C bus.
The AGC-detector operates on top sync or top white level.
The MPIF IC has an integrated sound trap filter. The trap frequencies can be switched via the I2C-bus.
Also, a group delay correction filter is integrated. The filter can be switched between the PAL BG curve and a flat group delay response characteristic. This has the advantage that in multi-standard receivers the video SAW filter does not need to be switchable (cost effective).

Sound IF

The MPIF has a separate sound IF input to enable Quasi Split Sound (QSS) applications. The sound IF amplifier is similar to the vision IF amplifier and has a gain control range of about 55 dB.
The AGC detector measures the SIF carrier levels (average level of AM or FM carriers) and ensures a constant signal amplitude for the AM demodulator and QSS mixer.
For applications without SIF SAW filter, the IC can also be used in intercarrier mode. In this mode, the composite video signal from the VIF amplifier is fed to the QSS mixer and converted to the intercarrier frequency. AM sound demodulation is realized in the analog domain with the QSS mixer.

Source Selection

The following selector parts can be identified:

- **CVBS/YC source selector.** The video input selector consists of four independent source selectors, that can select between the CVBS signal coming from the IF part and four external CVBS signals. Two of the external CVBS inputs can also be used as YC input. One selector is used for selection of the primary video channel. A second selector selects the CVBS or YC signal for the secondary channel. The third and fourth selectors are used for selection of analog CVBS outputs A and B for SCART or line output. The primary channel can be a CVBS or YC signal. If an YC signal is selected for the secondary channel or external CVBS outputs A or B, the luminance and chrominance signals are added so that a CVBS signal is obtained. The video identification circuit detects the presence of a video signal on the CVBS_IF input (CVBS0). The identification output can be read via I2C bus and is normally used to detect transmitters during search tuning.
- **RGB/YPbPr source selector.** The IC has two RGB inputs. Both inputs can also be used as YPbPr input for connection of video sources with an YPbPr output like a DVD player.

The RGB inputs can also be used for fast insertion of RGB signals (for instance on screen display menu's) in the primary CVBS signal. The fast insertion switch is located in the digital video processor. The RGB signals are converted to YUV before further processing. The YUV output signal is digitized with the help of two A to D converters. The U and V components have half the bandwidth of the Y signal, because the U and V signals are multiplexed and digitized with the help of **one** A to D converter.

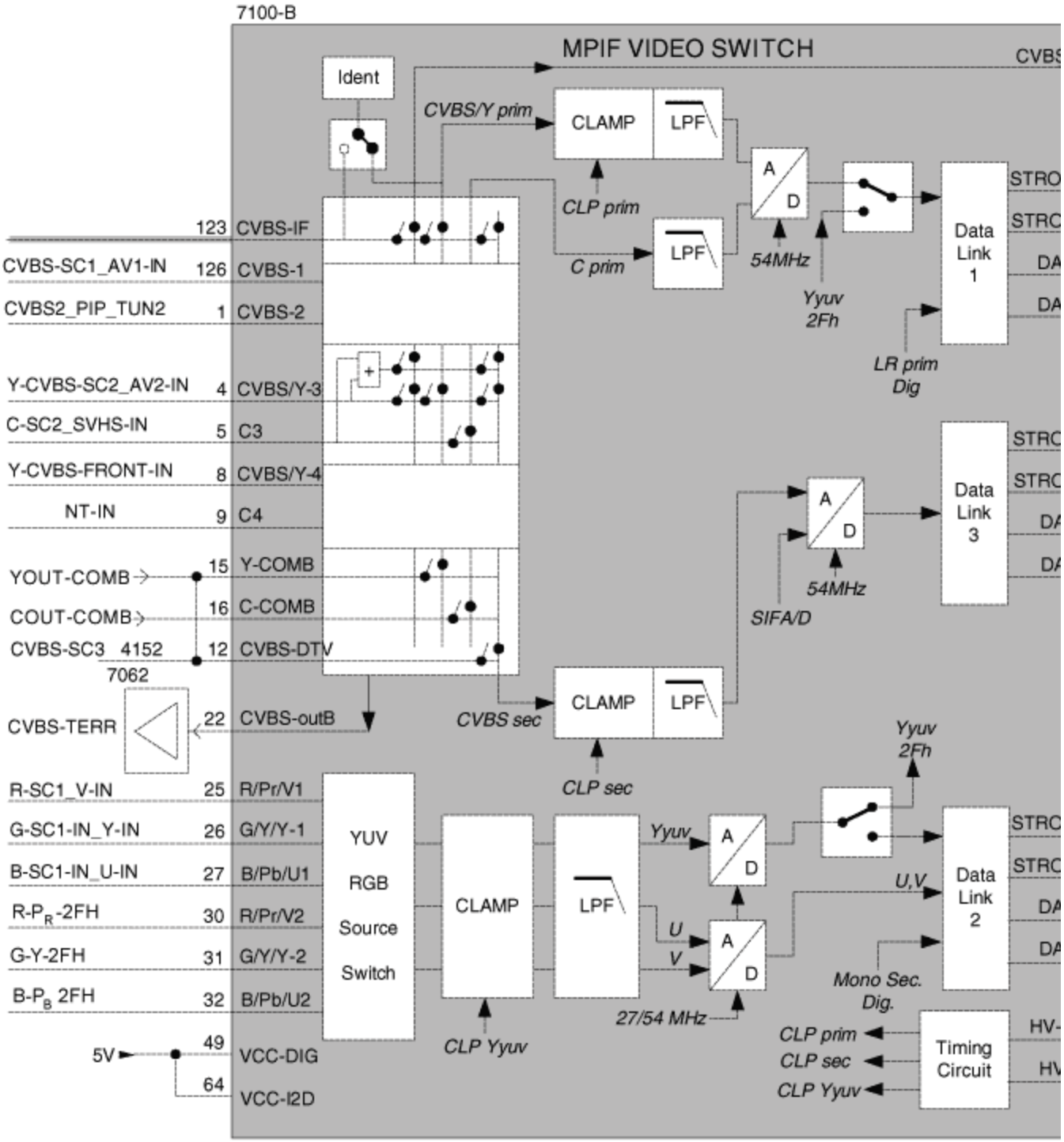


Figure: MPIF Video source selection

- **Audio source selectors.** The MPIF contains two different audio source selectors. The first selector selects which audio signals are routed to the audio ADCs for further processing in the digital domain. The selector has two outputs, a primary channel and a secondary

channel:

- The primary audio channel is used for one stereo signal. The secondary audio channel can carry a second stereo signal or AM sound signal.
- The second selector selects which audio signals are fed to the analog audio outputs for SCART (EU only) and line out. This selector has also two stereo inputs for demodulated sound signals coming from the digital video processor.

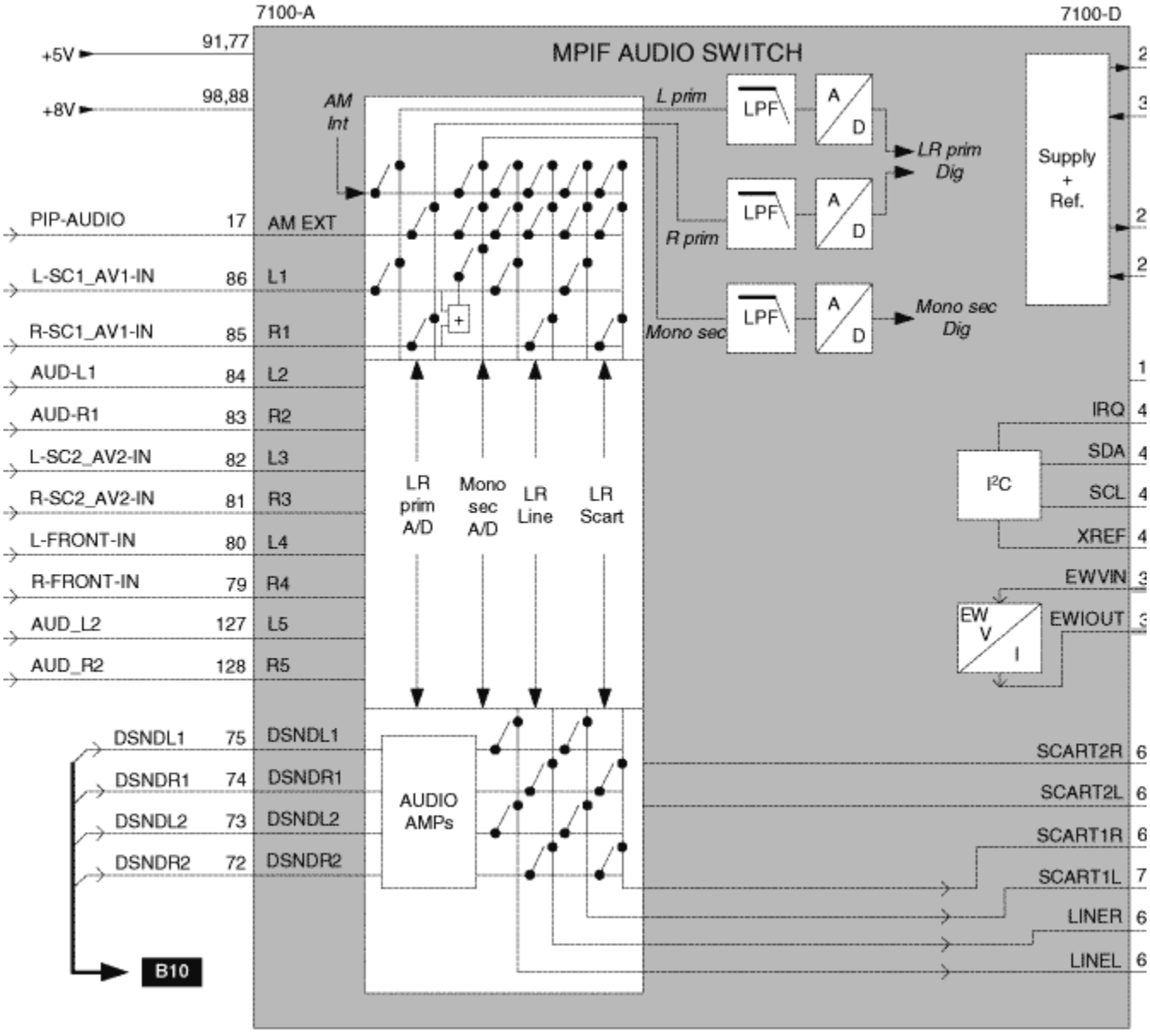


Figure: MPIF Audio source selection

A to D Converters

The MPIF contains four video ADCs for analog and digital video broadcast signals. The clock frequency for these ADCs is either 27 MHz or 54 MHz. In some cases, two analog signals are multiplexed at the input of one ADC. In these cases, the clock frequency of the ADCs is 54 MHz, while the sample frequency for each of the two signals is 27 MHz.

The sample frequency for standard 1fH video signals is 27 MHz.
For the YUV channel the sample frequency of the U and V components is half the sample frequency of the Y signal.
For 2fH YPbPr or RGB input signals (for instance 480p or 1080i ATSC signals), the frequency that is used to sample the YUV signals is twice as high as for 1fH signals. The sample frequency is 54 MHz for Y and 27 MHz for U and V.
Due to the high sample frequency, two data links are needed for transport of the video data to the digital video processor.

Data Link Interface (I2D)

The digital interface between MPIF and ADOC is called Data Link (or I2D Link). Data Link is a pin efficient, EMC friendly and power efficient serial interface that transfers the data from MPIF to ADOC over three Data Link interfaces. Each Data Link has a data signal and a strobe signal. The synchronization information is distributed over the data and the strobe signal. To minimize EMC, both signal outputs are low voltage differential swing signals, with a swing of about 300 mV.
Each Data Link has four lines, one differential pair for the data, and one differential pair for the strobe. The data rate is 594 Mbit/s. Each Data Link can carry two 27 MHz sampled video streams (or one 54 MHz sampled 2fH video stream) and two audio channels sampled at 6.75 MHz.

In the MPIF, the (video and audio) data to be transmitted is multiplexed in an output register of 42 bits. The content of that 42 bits register is serial transmitted on one of the three data links. In the ADOC, the serial data is de-multiplexed into parallel streams. The data on the data link is divided in several groups of signals (video, audio and strobe signals). Obvious it is important that the transmitter and receiver are in the same transmitting mode.

ADOC Digital TV Processor

Introduction

The A02 system is built around the ADOC IC. This chip implements all TV functions in digital technology. Only a few functions (like AD-conversion, IF processing and source select) are

implemented in an analog companion IC, the MPIF.
The ADOC (Analog Digital One Chip, type number PNX3001-3008, item number 7300) is a fully integrated, digitally implemented TV processor for audio, video, VBI services, graphics, and control. It is a global, multi-standard system primarily designed for the reception and processing of analog broadcast signals.
An integrated MIPS 1910 processor runs the chassis software. This software is stored in a non-volatile external flash memory (item 7790). Following figure shows the ADOC block diagram.

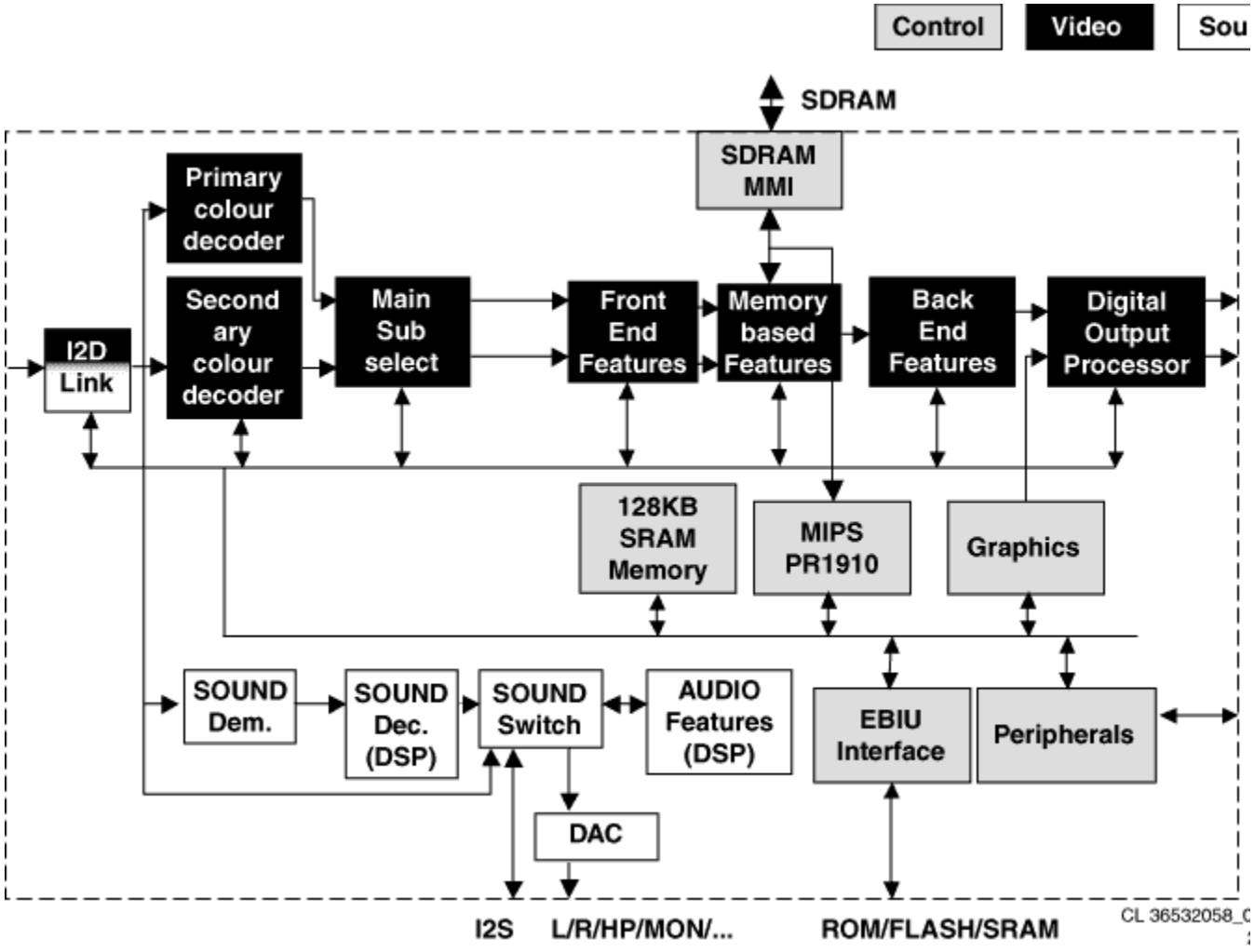


Figure: ADOC block diagram

The dual stream architecture of the ADOC system allows audio and video processing of two A/V sources simultaneously. The two video streams can be displayed in several programmable ways (main screen, PIP or DW). The two audio streams are audible via the TV loudspeakers and/or the headphones.

For the memory-based features (like scan rate conversion, 3D-Comb filtering, dynamic noise reduction, and PIP/DW applications), external SDRAM is used (item 7730).
The ADOC also has 128 kBytes of internal SRAM memory. This memory is used to run low latency, timing critical parts of the software. The internal memory is also used if the system operates in a single scan 50/60 Hz interlace application without any other kind of memory based features. Under these circumstances, no external SDRAM is needed.

Some ADOC features:

- Video Decoding:
  - 2-Colour Decoder (PAL, NTSC, SECAM).
  - 2D and 3D Comb filter.
- Memory Based Features:
  - PIP/DW, DNR, Scan Rate conversion.
- Picture Improvements:
  - CTI, LTI, Color correction.
- Digital Output Processor:
  - RGB processing, Scavem, Deflection control.
- Audio Processing:
  - Demodulator/Decoder (A2, NICAM, BTSC).
  - Tone, Volume, Balance, Dolby ProLogic.
- VBI (Vertical Blank Interval) Services:
  - Teletext or Closed Caption, V-chip.
- TV Control:
  - I2C, UART, IR, Keyboard.
- Graphics:
  - Character based.

Video Decoding (VIDDEC)

The Video Decoder (VIDDEC) is the video input processor and color decoder. There are two VIDDECs: the primary and the secondary VIDDEC. The VIDDEC processes all CVBS, Y/C, and 1fH/2fH component (e.g. RGB) video input signals.

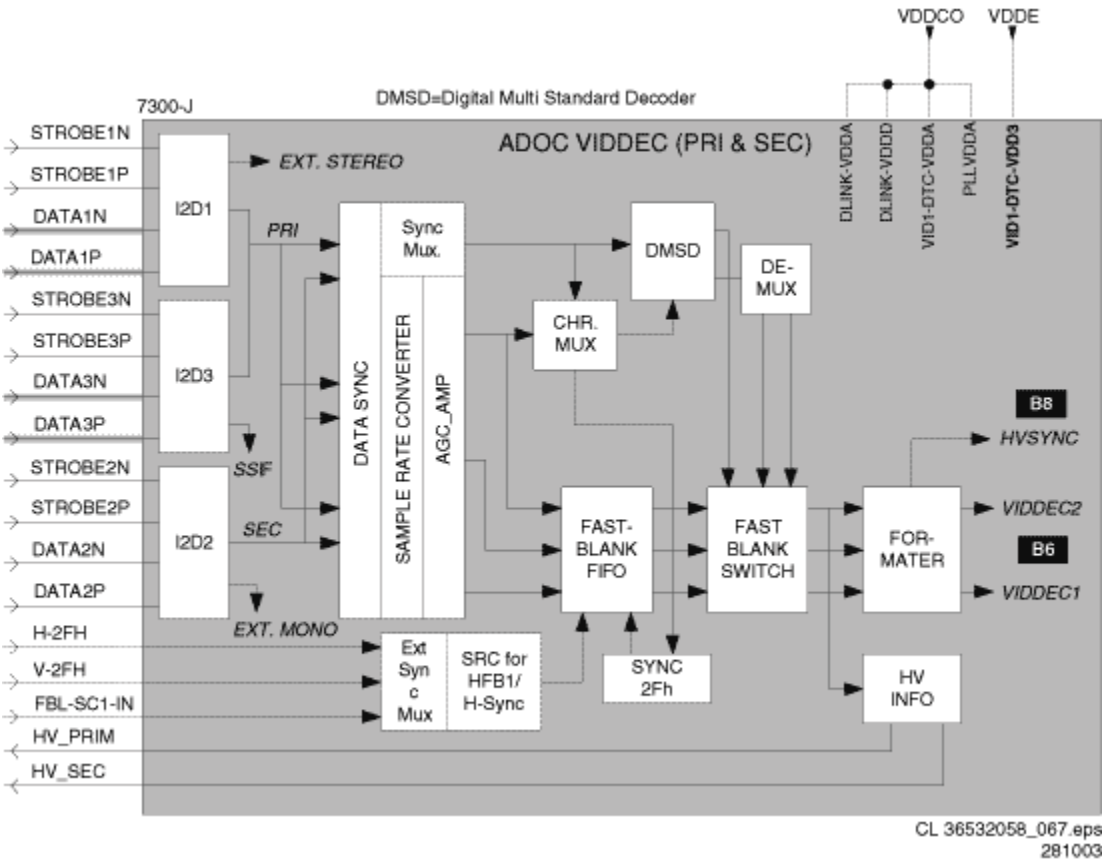


Figure: VIDDEC block diagram

Primary VIDDEC (1fH/2fH)

The primary VIDDEC supports the following functionality:

- Conversion of the digitized samples from MPIF into orthogonal samples (meaning fixed number of pixels per line, independently of line frequency).
- Correction for any amplitude errors of the input signals (CVBS, YC, or YCbCr) by means of an Automatic Gain Control (AGC).
- Standard detection of PAL/NTSC or SECAM and various 1fH/2fH component input formats.
- Color decoding for PAL, NTSC, or SECAM input signals.
- Sync identification (to be used for channel search).
- Sync processing for any 1fH or 2fH input signal.
- Fast-blank insertion of RGB signals (supplied via MPIF) on CVBS input signals.
- 2D Comb filtering. 3D Comb filtering is implemented in the Memory Based Feature block of the Feature Box.

Secondary VIDDEC (1fH)

The secondary VIDDEC is mainly intended for use with PIP/DW. It supports the following functionality:

- Conversion of the digitized samples from MPIF into orthogonal samples (meaning fixed number of pixels per line, independently of line frequency).
- Correction for any amplitude errors of the input signals (CVBS) by means of an Automatic Gain Control (AGC).
- Standard detection of PAL/NTSC or SECAM and various 1fH component input formats.
- Color decoding for PAL, NTSC, or SECAM input signals.
- Sync identification (to be used for channel search).
- Sync processing for any 1fH input signal.
- CVBS 1fH input signals only.

Data Synchronizer and Sample Rate Converter

The data synchronizer is a de-multiplexer that separates the UV stream into a separate U and V data stream. The sample rate converter converts the video samples from the crystal clock domain to the so-called line locked clock domain, 720 pixels per line.

Automatic Gain Control (AGC)

The AGC amplifier block controls the gain of the signal and is controlled directly by the chassis software. This gain will depend on the amplitude of the output signal (signal amplitude and/or sync amplitude) as measured by the AGC gain block. As a secondary function, it controls both the offset at the input and the offset at the output of the gain control.

Digital Multi Standard Decoder (DMSD)

This DMSD block contains the following functionality:

- Decodes a CVBS or Y/C (primary VIDDEC) signal and converts it to an YCbCr signal format. All world color standards are supported.
- YC detection (primary VIDDEC) via a SW algorithm.
- 50/60 Hz, interlace/progressive, field polarity, and no-YC detection.
- A chroma notch with programmable width.
- 2D Comb filter (primary VIDDEC). The 3D Comb filter uses the attached SDRAM memory and is implemented in the FBX.
- Macro vision detection.

Comb Filter

The ADOC 2D comb works purely in the vertical direction, but can bypass the entire signal as luminance straight away. The 2D comb uses the 180 degrees phase shift of the color carrier between successive lines or two lines apart. Adaptive two or four delay lines 2D Y/C comb filtering is only possible for sources routed onto the Main-Video path.

In the 3D comb filter implementation (for USA only), the 2D comb filter processing in ADOC IC (on the Main-Video path) is disabled via SW. The signal input for the 3D YC comb-filter circuit is derived from the CVBS-SC2_MON-OUT signal path. The processed signal is re-inserted back via YCOMB and CCOMB inputs of the MPIF IC.
The 3D Comb filter is integrated in one IC (type uPD64083). The block diagram of the 3D Comb panel is indicated in the next figure (re-use of R8 manual, does not reflect the actual circuit **exactly**).

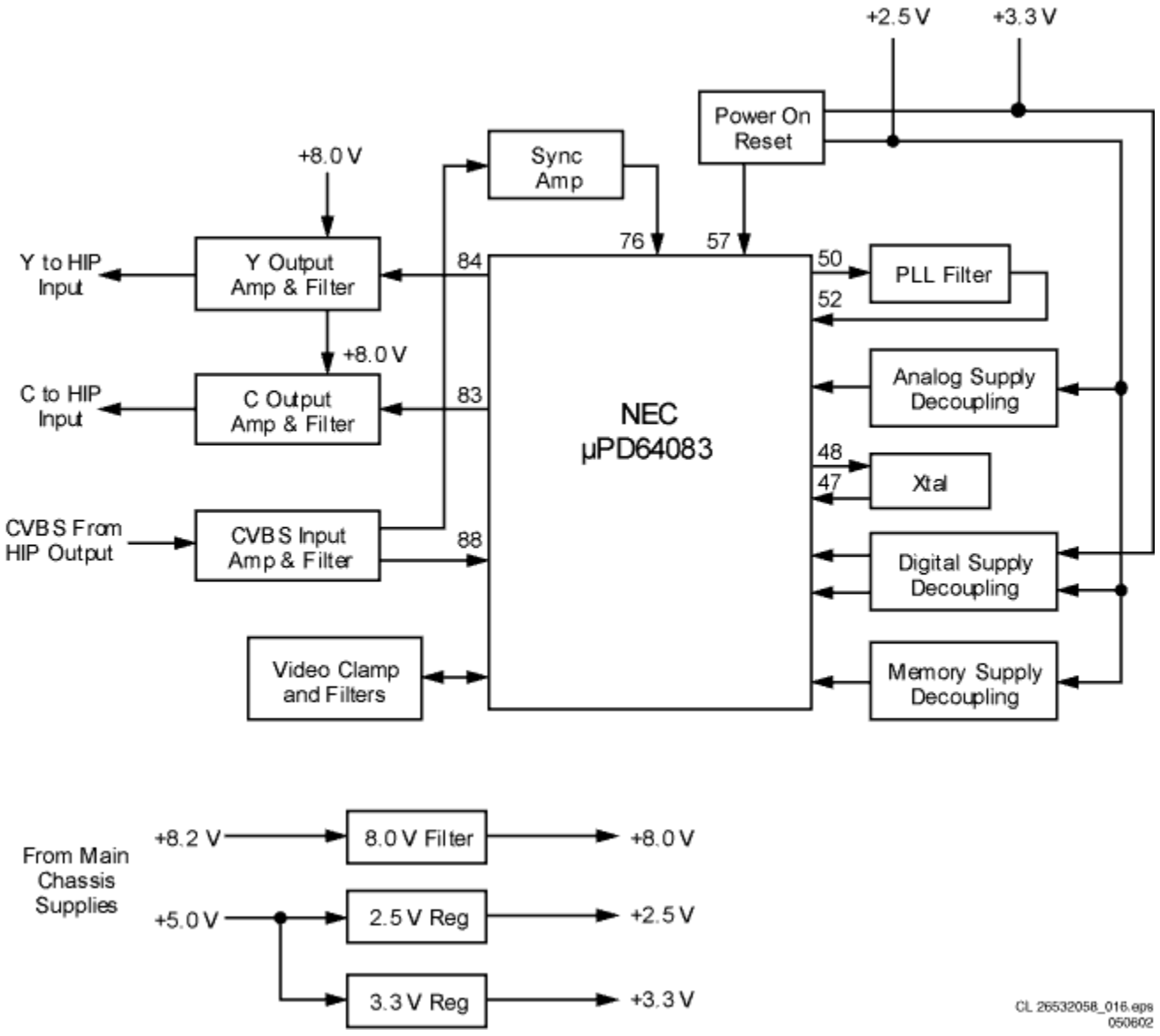


Figure: Block diagram 3D comb filter

Standard Detection

The Standard Detection part identifies PAL/NTSC/SECAM/BW but also involves Horizontal and Vertical sync identification (both 1fH and 2fH) as well as YC detection (via a SW algorithm).

YUV Multiplexer

The YUV mixer selects between the YUV output of the DMSD and 1fH component video input signals (RGB, YPbPr) or 2fH input signals (RGB, YPbPr, ATSC). The YUV mixer can also be controlled via a fast blanking input (SCART) to insert RGB signals, such as descrambler OSD or full RGB insertion of DVD players.
When a 2fH input signal is selected as an input, the complete primary VIDDEC is running at 2fH (54 MHz), including DMSD (in this scenario, the DMSD cannot be used any more for CVBS input signals, and as such, VBI data slicing cannot be done).

Feature Box

The Feature Box (FBX) in the ADOC can be divided into three functional parts: The front-end features (FEF), memory-based features (MBF), and back end features (BEF).

The FEF part of the FBX implements all signal analysis functions as well as black stretch and histogram correction.
The MBF part applies spatial scaling, temporal noise reduction and up-conversion to either progressive scan or a double field rate (100 Hz).
The BEF part implements spatial picture enhancement functions like sharpness and color enhancement functions, sharpness measurement and horizontal scaling and panorama
The FBX has two video inputs coming from VIDDDEC 1 and 2, and outputs one RGB video stream to the display output processor (DOP).
The following sections describe the three functional parts of FBX in more detail.

Front End Features (FEF)

The FEF consists of several signal analysis functions (HME, BLD, BBD, NEST), histogram correction (HMO) and black-stretch (BS). Following figure shows the functional block diagram of the video frond-end features (FEF). All signal processing in the FEF is nine bits based.
The FEF has two video inputs coming from the VIDDECs. For every block, one video source can be chosen as input, independently for every block. The FEF has two video outputs, designated as 'main' and 'sub'.
Histogram modification can only be performed on the main channel; therefore, the HME block

is general connected to the same video source as the main channel. Besides the two VIDDEC inputs, there is also a third virtual input, the 'blanking' input. Only main and sub can be connected to this blanking input, and at the same time, it can be specified which sync source has to be used (VIDDEC1 or VIDDEC2).

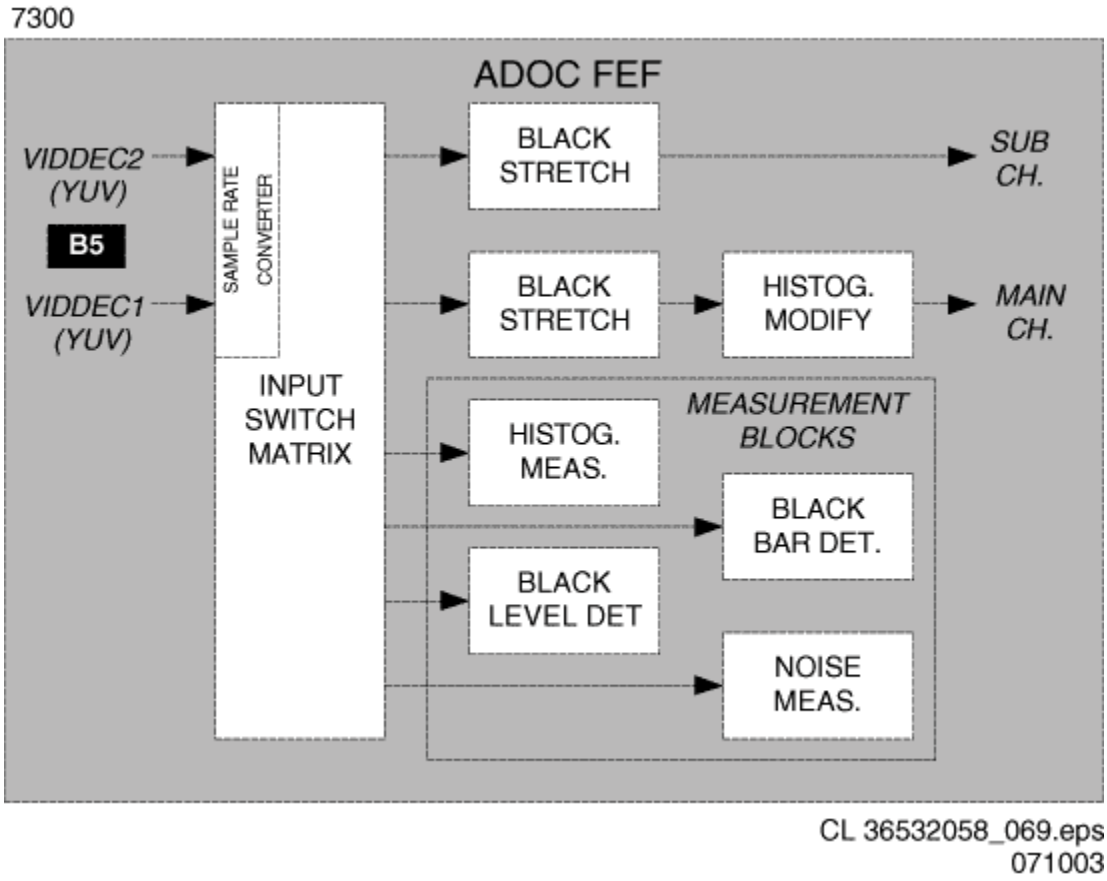


Figure: FEF block diagram

When a single stream is displayed, the main output is used for this stream. Also, all signal analysis functions should be connected to the same VIDDEC as the main channel is connected to.
When two streams are displayed, then there are two user scenarios: Picture In Picture (PIP) and Double Window (DW). In the PIP scenario, the full screen picture is displayed via the main channel, and the PIP stream is switched to sub. In the DW scenario, selection of the video sources for main and sub depends on if the two streams have a different vertical resolution and how the system has to cope with this difference.

Following blocks are present:

- **Black Stretch (BS).** The function of BS is to pull the dark areas in a picture to even darker levels. BS is available in both the main and sub channel.
- **Histogram (HMx).** This block measures of every field in a programmable (measurement-) window the histogram of the luminance signal. The measurement window is set-up such that the area that contains the subtitles or black bars does not contribute to the histogram.
- **Black Bar Detection (BBD).** Many broadcasts or software played on TVs produce a so-called 'letterboxed' picture. Black bars appear above and below the picture. Due to bad standardization of the aspect ratio, e.g. the size of the black bars, there is a need to actively analyze the picture and determine of the picture is in letterbox format and what the size of the black bars is. Black bars are detected by determining if a defined number of pixels (analyzed within a programmable window located in active video) are black. The output of the BBD is the first non-black line and the last non-black line.
- **Black Level Detection (BLD).** The BLD determines within a programmable (measurement) window the 'black level' of a picture. The BLD will be used for the BS, but if required, it can also be used for the BBD. The BLD function records in multiple small windows within the measurement window the maximum luminance. The minimum luminance level of the various recorded maximum luminance levels is the true black level. By measuring the maximum luminance level in a small window, the BLD is not sensitive to 'black' spikes.
- **Noise Estimation (NEST).** The NEST block analyses the video and outputs a number correlating to the amount of noise in the picture. A basic problem is that picture detail is also 'recognized' as noise. Several control- and status-registers are added to compensate this. The video signal is only analyzed when it is within a programmable (measurement) window. This window coincides with a rectangular shaped part of the (visible) picture. Normally this is the centre part of the picture.

Memory Based Features (MBF)

The Memory Based Features (MBF) block embodies a set of functions that require (shared) memory.
The main and sub video streams can be spatially compressed in order to produce a mixed output in the form of several PIP combinations or DW.
The main video stream can be passed through a temporal noise reduction circuit (DNR).
The 3D Comb filter is also implemented in this block.
The main and sub streams are merged when reading from memory. The merged video stream can be up-converted to either a double line rate (progressive scan) or to a double field rate (100 Hz). The up-conversion is done by means of a digital scan function. Following figure shows the functional block diagram of the video memory based features (MBF).

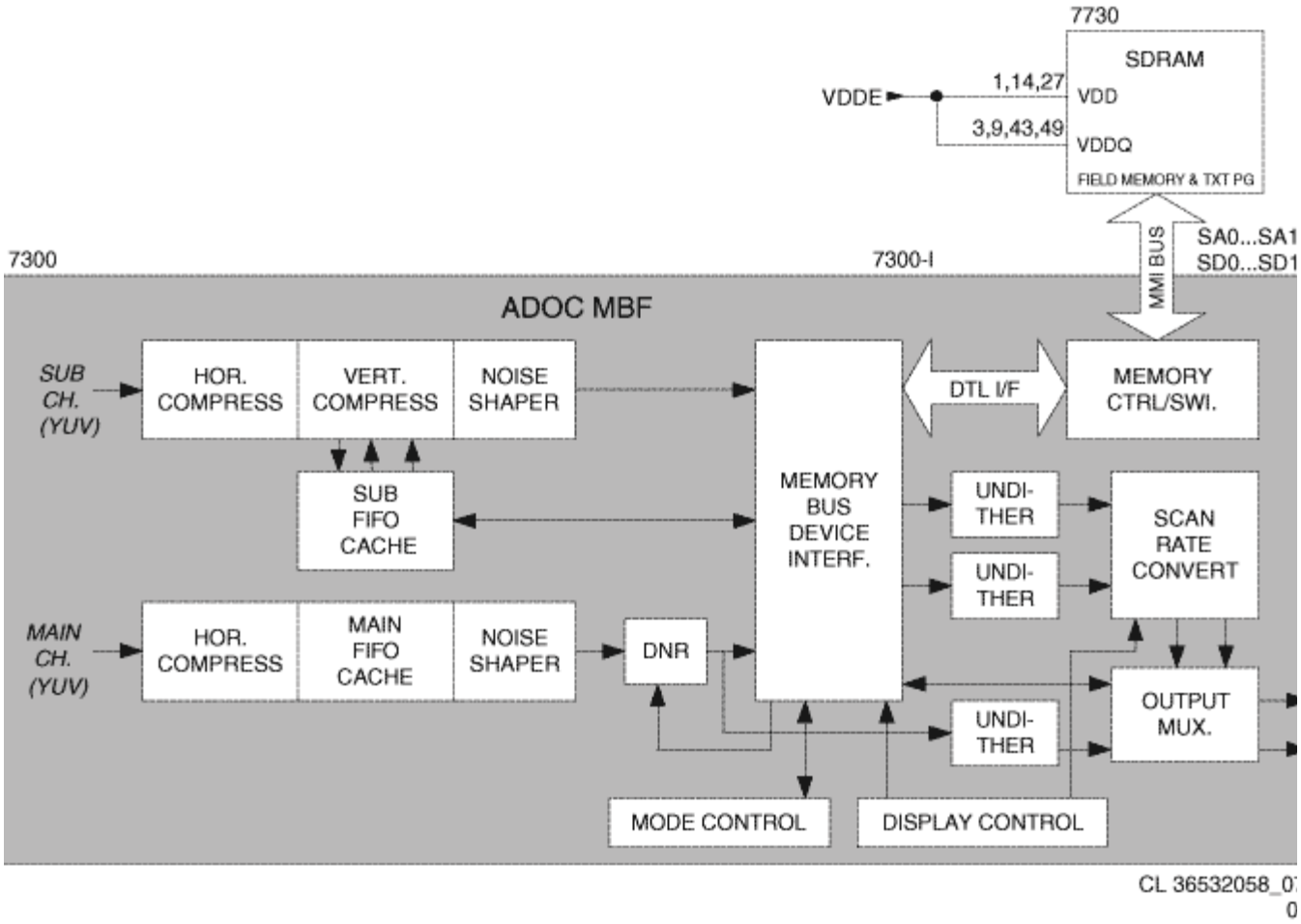


Figure: MBF block diagram

Back End Features (BEF)

The Back End Features (BEF) block embodies a collection of spatial picture enhancement functions.
The video display has to be blanked during AV switching, channel switching, V-chip, and Child Lock modes. This is done inside the BEF block of the ADOC IC. The fast blanking signal input from SCART1and SCART3 (TV SCART inputs) for RGB video insertion is connected to the ADOC IC.

Sharpness functions are:

- Luminance Transient Improvement (LTI),
- Dynamic Peaking, and
- Digital Color Transient Improvement (DCTI).

The panorama block does the non-linear scaling for displaying 4:3 formats on a wide-screen display.

Color enhancement functions are:

- Skin Tone Control,
- Blue Stretch, and
- Green Enhancement.

A color Space Converter can convert the video signal from YUV to RGB format. The Frame Processing block can insert frames and borders such as a colored frame around the Picture in Picture (PIP). Following figure shows the structure of the Back End Feature block.

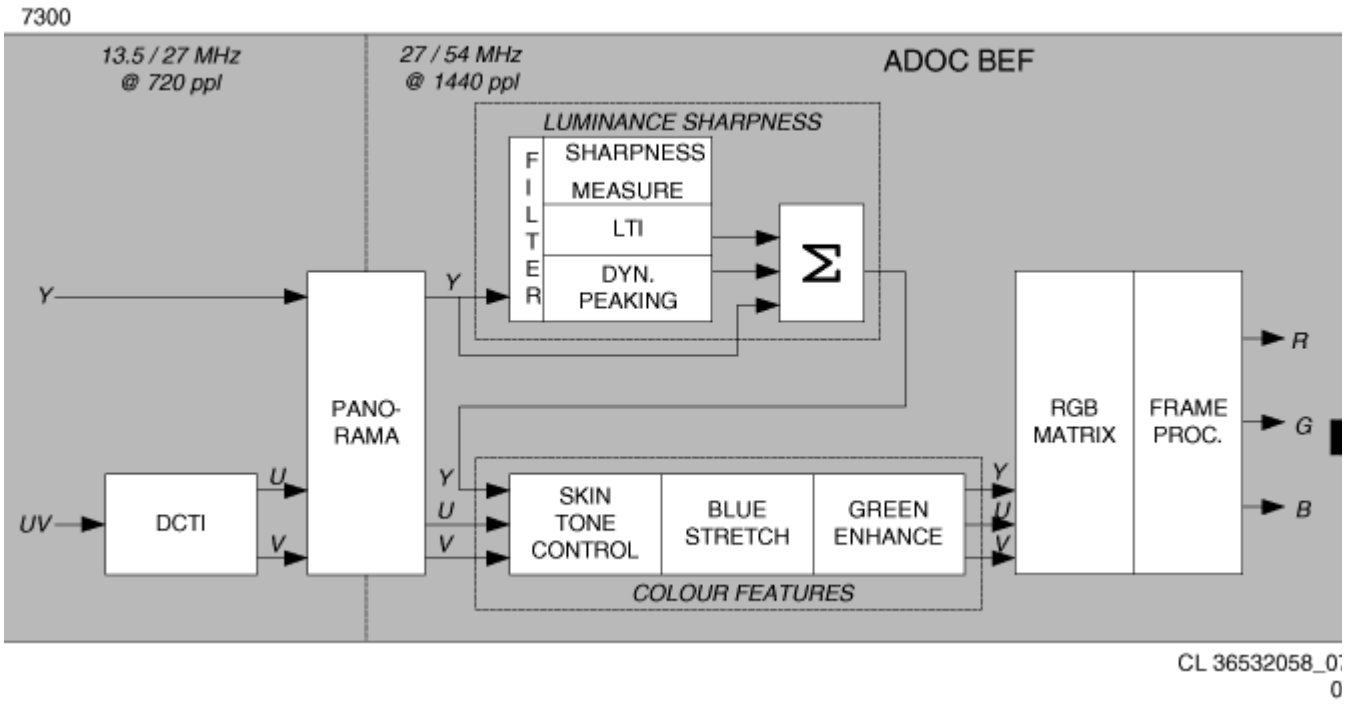


Figure: BEF block diagram

Digital Output Processor (DOP)

The DOP is a display processor block, and contains the following functions:

- **RGB control processor** with linear RGB input for the main video signal, a linear RGB input for OSD/text signals with blending, and an RGB output stage with black current

stabilization which is realized with the continuous cathode calibration (2-point black current measurement) system.

- **Programmable deflection processor** , driven by an external crystal clock, which generates the drive signals for the horizontal, east-west, north-south and vertical deflection with extensive geometry correction capabilities.
- The circuit can be used in both single scan (50 or 60 Hz) and double scan (100 or 120 Hz) applications.

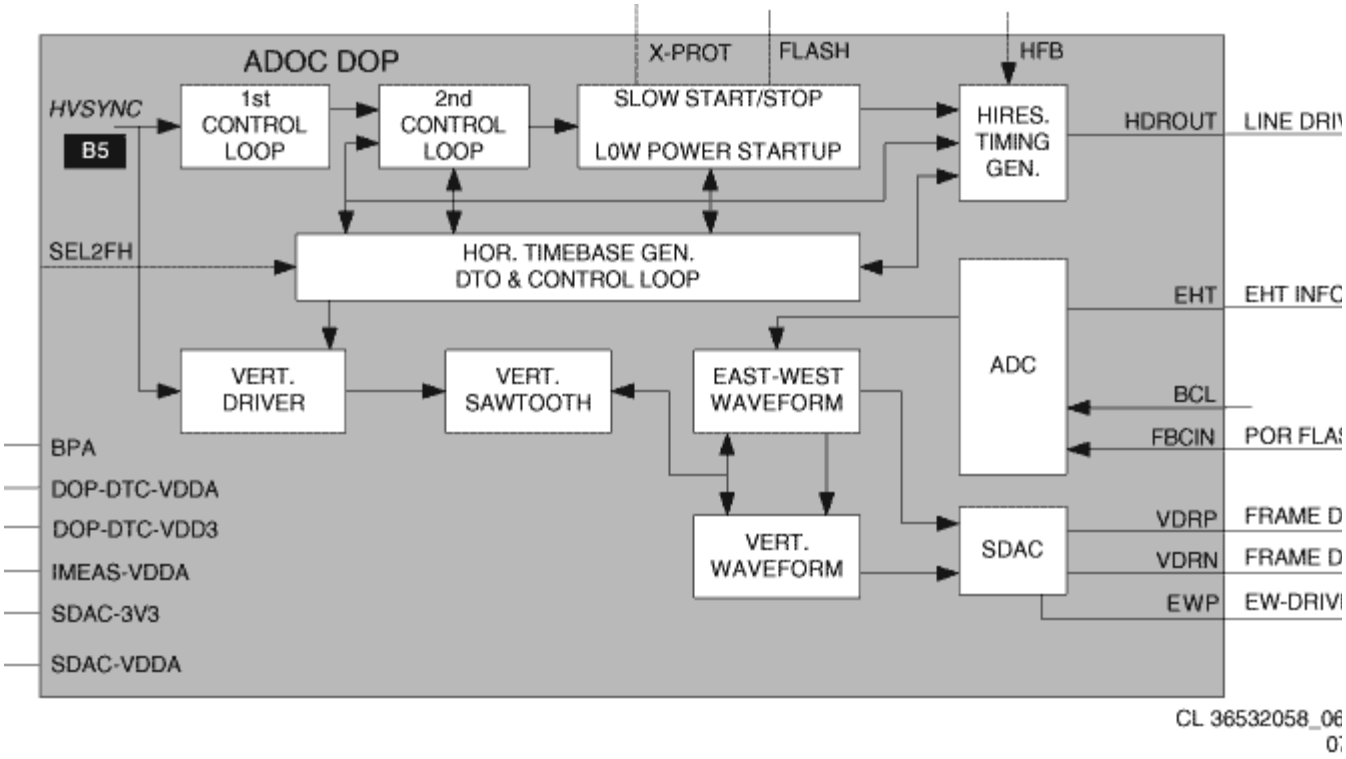


Figure: DOP block diagram

RGB Control Processing

- The RGB control circuit of the DOP contains two sets of input signals:
  - The first RGB input (RGB), 10 bits wide, is intended for the normal video signals coming from the BEF part. The 'RGB' signals will first enter a contrast control stage, followed by a brightness control stage, both influenced by a combination of user control, Beam Current Limiter and Peak White Limiter, followed by a soft clipper stage. Then the signal will be applied to the blender stage. The blender input signal will be used as an input for the peak white limiting system.
  - The second RGB input (GFX), 4 bits wide, is intended for OSD and Teletext

signals. The switching between the internal signal and the OSD signal is realized via a blending function. The 'GFX' input signals will be re-formatted to 10 bits wide internally before entering the Beam Current Control brightness correction stage, followed by the hard clip stage. Then the signal will also be applied to the blender stage.

- The blender combines the two input data streams into one stream. A third data stream controls this blender.
- The next block is the 'Drive Adjust' part. It contains a Picture Tube Biasing system, a Beam Current Control, and Peak White Limiting part.

In order to enhance the spatial bandwidth of the CRT display, Scan Velocity Modulation (SCAVEM) is implemented on the CRT-panel.

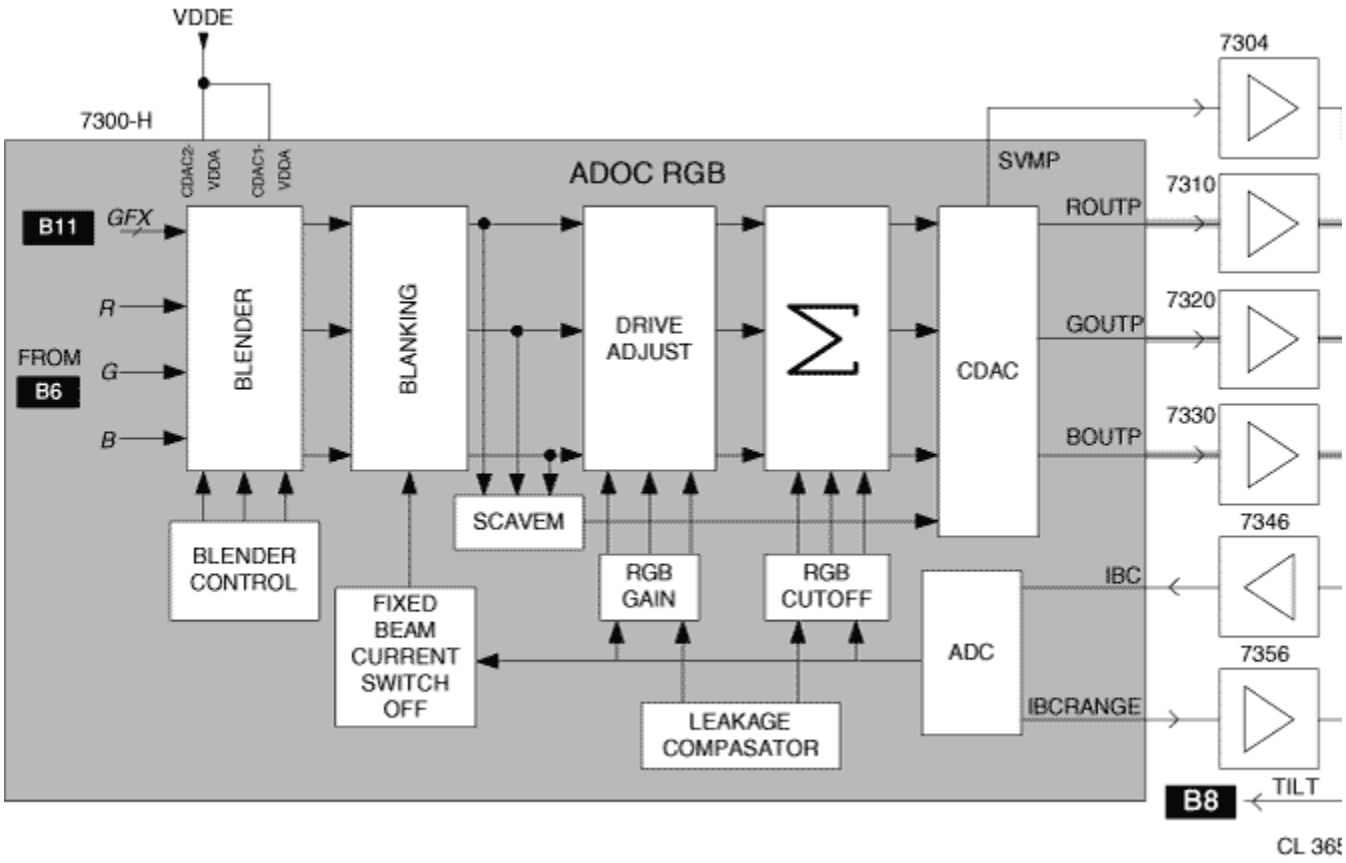


Figure: ADOC RGB control block diagram

Synchronization and Deflection Processing

- **Horizontal synchronization and drive circuit.** The horizontal drive signal is obtained from an internal oscillator, which runs at a fixed frequency of 54 MHz. This oscillator is synchronized to the incoming horizontal H_D pulse by means of a digital PLL. The horizontal drive signal is generated by a second control loop, which compares the phase of the reference signal (applied from the internal DTO) to the horizontal flyback pulse HFB.
- **Vertical deflection and drive circuit.** The drive signals for the vertical and E/W deflection circuits are generated by a vertical divider, which derives its reference signal from the Horizontal Time base Generator. The incoming V_D pulse, generated by the input processor or the Feature Box, synchronizes this divider. The vertical drive output is realized by a differential voltage, which is generated by SDACs. The outputs must be DC-coupled to the vertical output stage (TDA8177, item 7620 on the LSP).

See also figure 'DOP block diagram'

Synchronization

Sync Flow

The CVBS signal on the SCART1/AV1 connector (CVBS-SC1_AV1-IN system signal path; designated as EXT 1 CVBS) is used to provide synchronization for the EXT1 RGB input. Besides providing synchronization for RGB source, EXT1 CVBS is also required for SCART2/AV2 CVBS output.

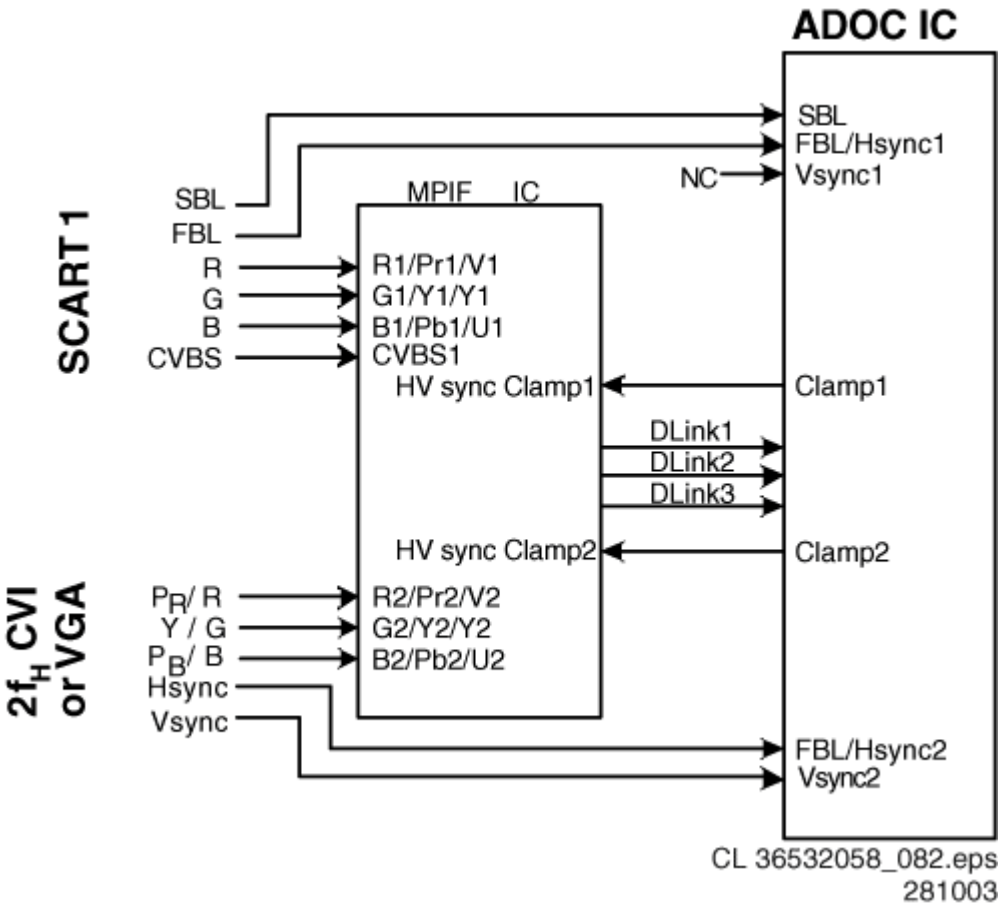


Figure: Sync flow block diagram

For 1fH CVI input, synchronization is derived from sync-on-Y.
For the 2fH CVI input, synchronization signal is derived from sync-on-Y input or the H_SYNC/V_SYNC.
In case of VGA input, synchronization signal is taken from H_SYNC and V_SYNC inputs
In case of HDMI input, synchronization signal is taken from H_HDMI and V_HDMI outputs from the HDMI panellink receiver.

Audio

Introduction

Sound IF processing, audio source selection, and audio analog-digital signal conversions are done in the MPIF IC. SIF demodulation, sound system auto-detection, audio base-band, and headphone processing is done in the ADOC IC. Therefore, the ADOC contains a digital TV sound processor for analog and digital multi-channel sound systems in TV sets. By hardware programming, several applications can be scaled.

The sound processing of the SALSA system can be split into three parts:

- Initial source selection and analog to digital conversion performed by MPIF.
- Demodulator and Decoder (DEMDEC) performed by the ADOC.
- Back End Features (BEF) performed by the ADOC.

MPIF Sound part

The (main) Tuner receives an RF signal and converts it to IF. Via the appropriate SAW filters, the SIF signal is delivered to the QSS mixer stage of the MPIF IC and if channels according to standard L/L' are received also to the AM demodulator. The Quasi Split Sound demodulation generates the SSIF or intercarrier signal. By the SSIF switch, it is possible to choose between the internally derived intercarrier and an external second SIF (e.g. from a PIP front end or 10.7 MHz radio). The selected SSIF passes some anti-alias filtering, is amplified in an AGC amplifier and is then converted from analog to digital (SSIF AGC/ADC). Together with other signals, the digitized SSIF is transferred via an I2D-Link to the ADOC IC.
The audio signal out of the AM demodulator is connected to the analog X-bar in the MPIF IC. All other inputs to this multiplexer/audio switch come from external, either from the PIP front end (AMEXT/PIPMONO) or SCART/CINCH (AUDxin) or the DAC1, DAC2 output signals from ADOC. The audio AD converters are digitizing the audio signals foreseen for further digital processing in ADOC. Three stereo outputs (AUDx out, LINE out) are available for connections to SCART/CINCH sockets.
The sound part of ADOC consists of the demodulator/decoder (DEMDEC), sample rate conversion (SRC), a digital input X-bar, the digital audio processing for the loudspeaker, headphone and DAC channels, the I2S processing and interfacing as well as the DA conversion. This part will be described in the next chapter.

ADOC Sound part

Introduction

The ADOC sound part contains two DSP cores as shown in the block diagram. The first core called DEMDEC-DSP is combined with DEMDEC (Demodulation/Decoding) hardware and the second core is the AUDIO-DSP. The DEMDEC-DSP is used for the decoder and demodulator tasks, plus the sample rate conversion.
The AUDIO-DSP is used for the sound features, from the level adjust unit up to the output cross bar. Audio DACs and I2S hardware (optional) are converting the processed signals to analog or digital audio.

All I2D data links carry sound signals. The data link processing splits them from the other

signals as video so that the DEMDEC block receives the second sound IF (SSIF) and the audio signals from the audio ADCs of the MPIF IC. The SSIF needs some hardware processing before it enters the DEMDEC DSP. The DEMDEC processing will be described in the next chapter.
The audio signals from the audio ADCs of the MPIF are passing the DEMDEC DSP only for source selection and sample rate conversion.
In this chassis, two of the DAC **outputs** are used to feed a headphone. Two other DAC stereo outputs are provided for the audio feedback to the MPIF IC. They are located to pins of the ADOC that suit best for connection to MPIF.

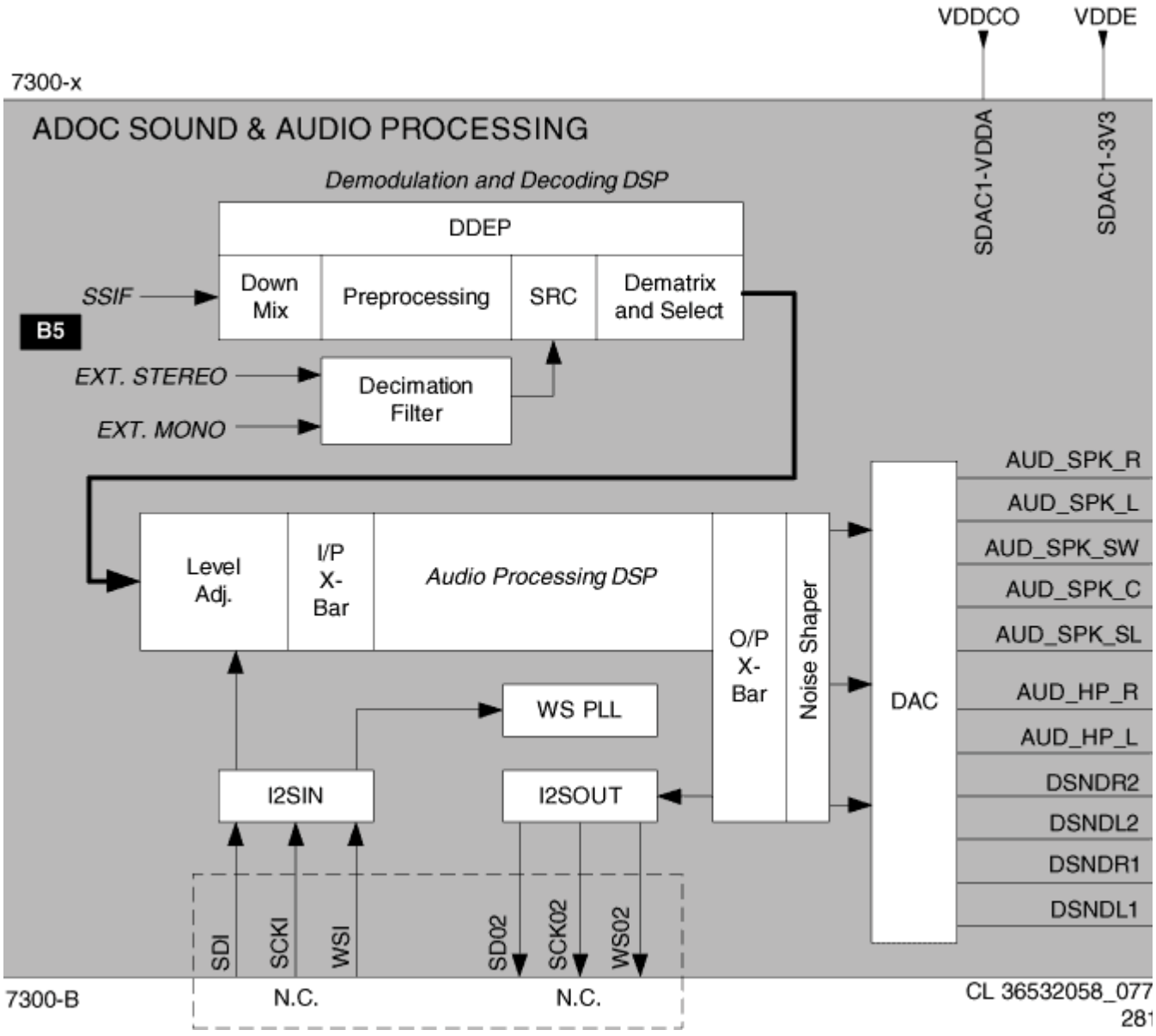


Figure: ADOC sound processing block diagram

DEMDEC DSP

The output signals of the above-mentioned hardware blocks, plus four audio ADC channels are read in by the DEMDEC DSP, processed, converted to the current audio sample rate, 'demultiplexed', and forwarded to the Audio DSP for further processing (volume, tone control, effects etc.).

Down Mixer

The digitized SSIF input signal is fed to the mixers, which mix one or both input sound carriers down to zero IF.

Pre-processing

This part contains the sound system identification and demodulation circuitry.

Audio Sample Rate Conversion (SRC)

All input signals pass through a sample rate conversion to the actual output sample rate (usually 48 kHz) such that the output rate does not need to be synchronized with any of the input rates. Up to five separate channels can be converted.

Audio Processing DSP

This block applies several filters, like down-sampling and de-emphasis, noise reduction processing, performs a sample rate conversion (SRC) to the current audio sample rate, and routes the decoded signals to the output channels.
The generic processing controls are Volume, Bass, Treble, Balance, Incredible Surround, Spatial (incredible mono), DBE, Dynamic Ultra Bass II (for non-woofer sets only), AVL, Sub-Woofer, and 5-band Graphic equalizer.
The Headphone volume can be separately controlled in the Headphone menu without affecting the master volume (the setting of the volume tables will be adapted after fine tuning).
For variable volume output for USA, the DAC1 output will switch to the Main channel and therefore the same volume curve for the Main Channel can be used.

Audio Amplifier

Speakers (diagram A6)

The audio output stage is built around IC7701, which is a balanced amplifier, and is located on the LSP. It uses a monolithic integrated power amplifier IC, the TDA7497. The gain of the

amplifier is constant. This means that volume control is done via the ADOC.
The supply voltage is +28 V, generated by the power supply via L5506 (or L5512). The TDA7497 delivers an output of 3 x 10 W_rms to two full range speakers and a (optional) subwoofer.

Muting

There are three types of muting available: system mute, headphone status mute, and user mute.

- **System mute.** System muting is implemented for 'special events' such as channel/source change event, loss of identification signal, 'on/off' switching of the set, during search and auto store/program, and/or sound mode change. This muting is transparent to the user. Audio output is muted before the above 'special events' occurred, to prevent problems such as audible plop. Muting is done via the SOUND-ENABLE (software controlled) and/or POR (hardware controlled) line connected (via TS7710 and 7711) to pin 10 of the amplifier-IC and coming from the ADOC microprocessor.
- **Headphone status mute.** A headphone status is available to detect the presence of the headphone and mute the main speakers if the headphone is detected. The microprocessor will read the FRONT-DETECT status.
- **User mute.** This is a mute option available to the user. The user select the MUTE option on the remote control to switch 'off/on' the sound output to the main loudspeaker and the (optional) subwoofer.

Headphone amplifier (diagram A7)

The headphone amplifier is built around IC7751 (NJM4556), which is a high-gain, high output current dual operational amplifier. The supply voltage is +5 V.

Control

Introduction

The MIPS processor within the ADOC performs the control of the complete SALSA system. This part of the document will examine the functions that enable the MIPS to operate and control the remainder of the SALSA system.

Some control features:

- MIPS1910 processor (MIPS).
- Embedded SRAM.

- External Bus Interface Unit (EBIU) for external memory access.
- SDRAM Interface.
- Interrupt Controller.
- Power and Clock management.
- General Purpose I/O (GPIO).
- Analog to Digital conversion.
- Two x I2C master/slave.
- Two x General Purpose Timers.
- UART.
- Two x Multi-standard VBI Data Capture Unit.
- EJTAG (for debug and boundary scan functions).
- Remote Control (Infra Red) pre-processing.
- Graphics.

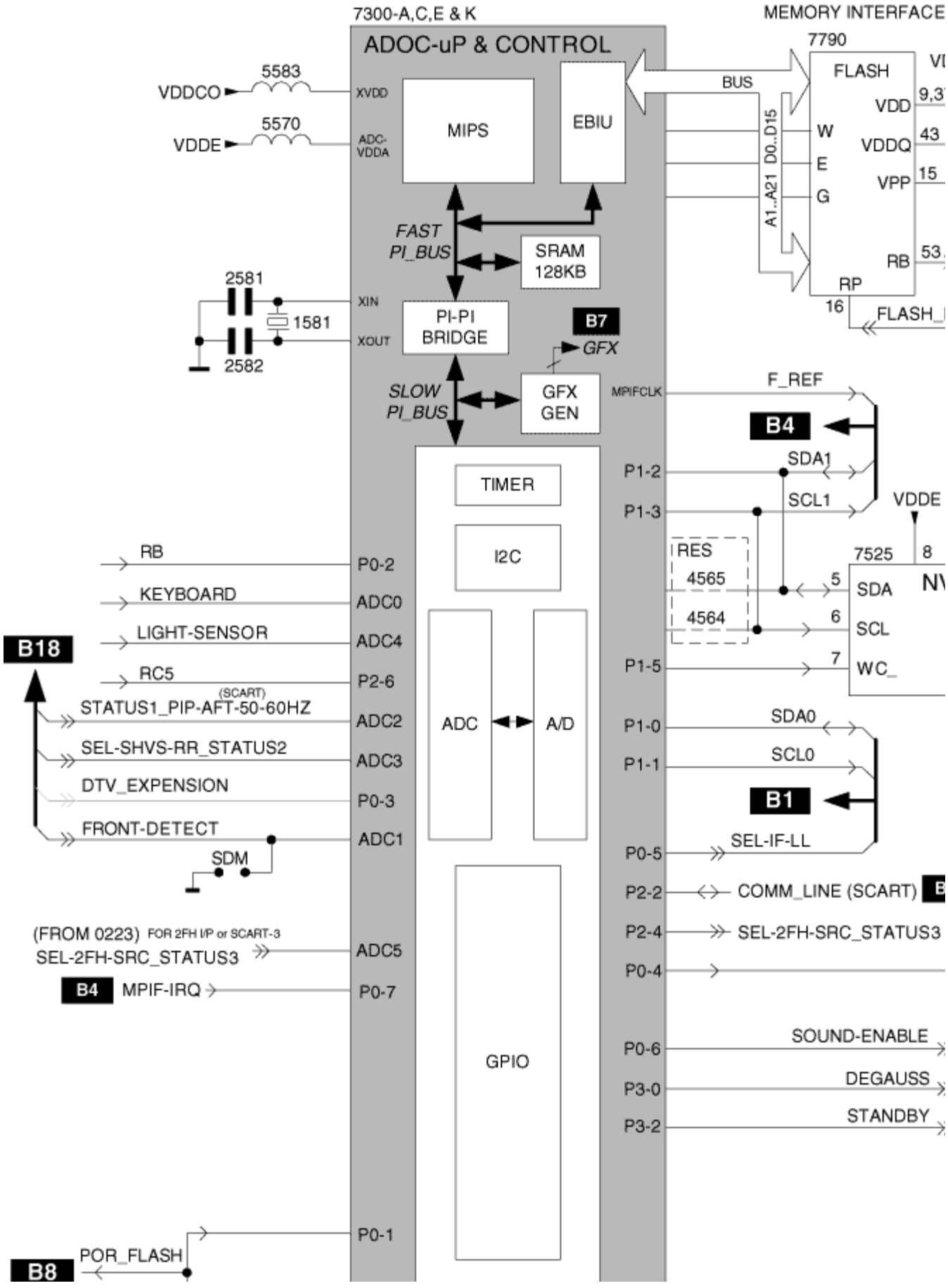

7300-A,C,E & K
ADOC-uP & CONTROL
MEMORY INTERFACE
7790
FLASH
VDDCO
5583
VDDE
5570
XVDD
ADC-VDDA
MIPS
EBIU
BUS
D0..D15
A1..A21
W
E
G
VDD
VDDQ
VPP
RB
RP
16
FLASH_
9,3
43
15
53
FAST PI_BUS
SRAM 128KB
2581
1581
2582
XIN
XOUT
PI-PI BRIDGE
B7
GFX
SLOW PI_BUS
GFX GEN
MPIFCLK
F_REF
B4
TIMER
I2C
ADC
A/D
GPIO
P1-2
P1-3
SDA1
SCL1
VDDE
RES
4565
4564
7525
SDA
SCL
WC_
5
6
7
8
P1-5
RB
P0-2
KEYBOARD
ADC0
LIGHT-SENSOR
ADC4
B18
RC5
P2-6
(SCART)
STATUS1_PIP-AFT-50-60HZ
ADC2
SEL-SHVS-RR_STATUS2
ADC3
DTV_EXPENSION
P0-3
FRONT-DETECT
ADC1
SDM
P1-0
P1-1
SDA0
SCL0
B1
P0-5
SEL-IF-LL
P2-2
COMM_LINE (SCART)
P2-4
SEL-2FH-SRC_STATUS3
P0-4
(FROM 0223) FOR 2FH I/P or SCART-3
SEL-2FH-SRC_STATUS3
ADC5
B4
MPIF-IRQ
P0-7
P0-6
SOUND-ENABLE
P3-0
DEGAUSS
P3-2
STANDBY
P0-1
B8
POR_FLASH

Figure: ADOC control block diagram

Internal Bus Structure

PI Bus

The Peripheral Interconnect (PI) bus connects all of the functional blocks within the ADOC device. Physically it is split into four distinct sections. These are referred to as:

- Fast PI Bus.
- Slow PI Bus.
- Video PI Bus.
- Sound PI Bus.

The individual segments of the PI bus are interconnected via PI-PI bridges. When several devices are connected to a bus system section only one of these may have control (ownership) of the bus section at any instant in time. The device that has control is referred to as the bus master, the remaining devices are referred to as slaves. Each bus segment section has a Bus Control Unit (BCU), which allocates bus ownership to the various modules that are capable of being bus masters. A bus master may have ownership of one or more sections of the PI bus.

Extension Bus Interface Unit

The Extension Bus Interface Unit (EBIU) allows various types of memory (ROM/FLASH/SRAM) to be attached to the ADOC IC and must therefore be configured per memory type (in terms of chip select lines, bus width used, and access times). This enables the hardware of the EBIU to correctly address the external memories and apply the correct number of wait states.

Microprocessor Reset

The reset of the device is split between three functions:

- Power-On-Reset (POR). Output is fed to the Power Clock Reset (PCR) block generating a Hard reset (all functions reset).
- PCR. In simplified terms two outputs are available:
  - Hard reset, all blocks within ADOC are reset.
  - Soft reset, a limited number of blocks within the control core are reset.

- GP registers are used to allow software control of the reset to certain blocks within ADOC.

External Bus Structure

I2C Bus

The system has two system I2C buses; one for the devices on the SSB and the other for the devices used in the external modules.

- The **I2C-1** system bus, comprises of SCL and SDA, is used to control all the I2C devices on the LSP (the main tuner) and other I2C devices connected to other external panels (PIP Front-End demodulation IC, PIP tuner, etc.). The I2C-1 is a 100 kHz bus and is called as 'slow' bus. It is connected to the +5V supply. All these devices are powered down in the Standby mode.
- The **I2C-2** system bus, comprises of SCL2 and SDA2, is used to control all the I2C devices (MPIF, 3D-Comb, NVM, etc.) present on the SSB. The I2C-2 is a 400 kHz bus and is called as 'fast' bus. It is connected to the +3.3V supply.

Protections

For a detailed description, see chapter 5 'Service Modes, Error Codes, and Fault Finding'.

Software Upgrading

In this chassis, you can **upgrade** the software via ComPair. This offers the possibility, to replace the entire SW image without having to remove the flash-RAM from its socket. You can find more information on how this procedure works in the ComPair file. It is possible that not all sets are equipped with the hardware, needed to make software upgrading possible. To speed up the programming process, the firmware of the ComPair interface can be upgraded. See Chapter 'Service Modes ...' paragraph 'ComPair' - 'How To Order' for the order number.

Abbreviation list

Table: Abbreviations

Abbreviation	Description

0/6/12	SCART switch control signal on A/V board. 0 = loop through (AUX to TV), 6 = play 16:9 format, 12 = play 4:3 format
2CS	2 Carrier Stereo
A2	Commonly known as two carriers sound (2CS) system
AC (or ac)	Alternating Current
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
ADOC	Analogue Digital One Chip
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic gain control (feedback) signal to the tuner.
AM	Amplitude Modulation
ANR	Automatic Noise Reduction: one of the algorithms of Auto TV
AP / A/P	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ASD	Automatic Standard Detection
AV	External Audio Video
AVL	Automatic Volume Level control
B	Blue
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BBD	Black Bar Detection
BCL	Beam Current Limiter
BC-PROT	PROTection signal to the microprocessor for a too high Beam Current.
BG	System B and G
BLC-INFO	BLack Current INFO
BLD	Black Level Detection
BS	Black Stretch

BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries
C	Chroma (video) / Centre channel (audio)
CL	Constant Level: audio output to connect with an external amplifier
CLUT	Colour Look Up Table
ComPair	Computer aided rePair
CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Colour Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronization
CVI	Component Video Input
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DC (or dc)	Direct Current
DCC	Dynamic Contrast Control
DC-filament	Filament supply voltage
DEGAUSS	Control line. Logic LOW to enable CRT degaussing. Logic HIGH to disable the CRT degaussing.
DFU	Directions For Use: owner's manual
DNR	Digital Noise Reduction: noise reduction feature of the set
DOP	Digital Output Processor (Part of ADOC which takes care of RGB control and delection)
DPL	Dolby Pro Logic
DRAM	Dynamic RAM
DS	Digital Scan
DSP	Digital Signal Processing
	Dealer Service Tool: special remote control

DST	designed for dealers to enter e.g. service mode (a DST-emulator is available in ComPair)
DTS	Digital Theatre Sound
DVD	Digital Versatile Disc
DVI(-d)	Digital Visual Interface (d= digital only)
DW	Double Window
DYN-FASE-COR	Dynamic phase correction, to correct the phase of the H-drive
EEPROM	Electrically Erasable and Programmable Read Only Memory
EHT	Extra High Tension
EHT-INFO	Extra High Tension INFOrmation, used for contrast reduction, vertical and horizontal amplitude correction, beam current protection, and flash detection
EMI	Electro Magnetic Interference
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
EPLD	Erasable Programmable Logic Device
EU	Europe
EW	East West, related to horizontal deflection of the set
EW-DRIVE	East -West correction drive signal.
EXT	EXTernal (source), entering the set by SCART or by Cinches (jacks)
FBL	Fast BLanking: DC signal accompanying RGB signals
FBX	Feature Box: module which contains 100 Hz processing, Pixel Plus, and AutoTV algorithms (FBX6= based on PICNIC, FBX7= based on PICNIC and Eagle)
FE	Front End
Field	Each interlaced broadcast FRAME is composed of two Fields, each Field consists of either Odd or Even lines
FILAMENT	Filament of CRT

FLASH	FLASH memory
FM	Field Memory / Frequency Modulation
FM Radio	Audio receiver which can receive the FM Band 87.5 - 108 MHz
FMR	FM Radio
Frame	A complete TV picture comprising of all lines (625/525)
FRAMEDRIVE -	Differential frame (vertical) drive signal (negative)
FRAMEDRIVE+	Differential frame (vertical) drive signal (positive)
FRC	Frame Rate Converter
FRONT-DETECT	Control line for detection of headphone insertion, Service Mode jumper, power failure detection.
FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
G	Green
Gb/s	Giga bits per second
H	H_sync to the module
H_2FH	Horizontal sync input for the 2fH source.
H_A50	Horizontal Acquisition 1fH: horizontal sync pulse coming out of the HIP
H_D100	Horizontal Drive 2fH: horizontal sync pulse coming out of the feature-box
H_DRIVE	Horizontal Drive
H_FLYBACK	Horizontal Flayback
H_OUT	H_sync output of the module
H_OUT	Horizontal Output pulse
HA	Horizontal Acquisition: horizontal sync pulse coming out of the BOCMA
HD	High Definition
HDMI	High Definition Multimedia Interface: Interface that supports RGB or YCbCr digital video at rates up to 5Gbps, up to eight channels of digital audio, along with a AV-link capability. Is meant as succesor of DVI.
HEADPHONE-L	Stereo headphone (Left) signal output.

HEADPHONE-R	Stereo headphone (Right) signal output.
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
HP	HeadPhone
HW	Hardware
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus (same as IIC)
I2S	Integrated IC Sound bus
IC	Integrated Circuit
IDRIVE-	Vertical drive -
IDRIVE+	Vertical drive +
IF	Intermediate Frequency
IF-TER	IF signal from main tuner
IIC	Integrated IC bus (same as I2C)
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in 'pairs', causing line flicker.
IO	In/Out
IR	Infra Red
IROM	Internal ROM (inside uP)
IRQ	Interrupt ReQuest
ITV	Institutional TV
JTAG	Joint Test Action Group. Definition for a standardised serial test interface
KEYB	Front panel keyboard
KEYBOARD	Input line: carries the voltage value of the corresponding tact switch on TOP-control or FRONT-control keypad
L	Left audio channel
L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I

Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at startup of the set to configure it according to the customer's preferences
LATAM	Latin America
LCD	Liquid Crystal Display
L-CL_VLOUT	REAR CINCH stereo output
LED	Light Emitting Diode
LFE	Low Frequency Enhancement audio channel
L-FRONT-IN	EXT3 stereo input
LIGHT-SENSOR	Ambient light intensity signal.
LINE DRIVE	Line drive signal (for the Line transistor)
LINEDRIVE1	Horizontal (line) deflection drive signal.
LNA	Low Noise Adapter / Low Noise Amplifier
LOT	Line Output Transformer
LPD	LG.Philips Displays
LS	Loudspeaker
Ls, Rs	Left surround and Right surround channel (audio)
LSP	Large signal panel
Lt, Rt	Left total and Right total in case of a Dolby ProLogic encoded signal (audio)
LTI	Luminance Transient Improvement
LTP	Luminance Transient Processor
LUT	Look Up Table
LVDS	Low Voltage Differential Signalling, data transmission system for high speed and low EMI communication.
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
Mb/s	Mega bits per second
MCS	Multi Channel Sound: refers to Dolby Pro Logic Surround in A02 ADOC
MDO	Mode control data output
	Microprocessor without Interlocked Pipeline-Stages.

MIPS	A RISC-based microprocessor.
Mips	Million instructions per second
MMI	Multi Media Interface
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MPEG	Motion Pictures Experts Group
MPIF	Multi Platform InterFace (Part of Salsa chipset, sister-chip of ADOC IC)
MPIP	Multi Picture in Picture: commercial feature showing several frozen or moving pips
MPX	MultiPleX
MSP	Multi-standard Sound Processor: ITT sound decoder
MUTE	MUTE Line
NAFTA	North American Free Trade Area (NAFTA & USA are used interchangeable)
NC	Not Connected
NDF	No vertical Deflection: vertical fly back protection
NHF	No Horizontal deflection: horizontal fly back protection
NICAM	Near Instantaneously Companded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
NTC	Negative Temperature Coefficient, non-linear resistor
NTSC	National Television Standard Committee. Colour system mainly used in North America and Japan. Colour carrier NTSC M/N= 3.579545 MHz, NTSC 4.43= 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
NVM	Non Volatile Memory: IC containing data such as alignments, stations
O/C	Open Circuit
OB	Option Byte
OC	Open Circuit
ON/OFF LED	On/Off control signal for the LED

ON/STBY	On/Standby
ON-OFF-LED	Active-LOW control line. Logic LOW = red LED on, HIGH = red LED off.
OP	Option Byte
OSD	On Screen Display
P50	Project 50: communication protocol between TV and peripherals
PAL	Phase Alternating Line. Colour system mainly used in West Europe (colour carrier= 4.433619 MHz) and South America (colour carrier PAL M= 3.575612 MHz and PAL N= 3.582056 MHz)
PC	Personal Computer
PCB	Printed Circuit Board (same as 'PWB')
PCM	Pulse Code Modulation
PILOT	Pilot Signal
PIP	Picture In Picture
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
POR	Power On Reset, signal to reset the microprocessor
POR_FLASH	Signal that informs the micro controller (painter) that set will switch off
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
PTC	Positive Temperature Coefficient, non linear resistor
PTP	Picture Tube Panel
PWB	Printed Wiring Board (same as 'PCB')
PWM	Pulse Width Modulation
QSS	Quasi Split Sound
R	Right audio channel
R	Red
RAM	Random Access Memory
RC	Remote Control transmitter
	Remote Control system 5, the signal from the

RC5	remote control
RC5 / RC6	Signal protocol from the remote control receiver
RDS	Radio Data System
RESET	RESET signal
RF	Real Flat / Radio Frequency
RGB	Red, Green, and Blue. The primary colour signals for TV. By mixing levels of R,G, and B, all colours (Y/C) are reproduced.
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync
RISC	Reduced Instructions Set Computer
RMS	Root Mean Square value
ROM	Read Only Memory
S	Surround channel or mono surround channel (audio)
S/C	Short Circuit
S/PDIF	Sony Philips Digital InterFace
SALSA	System Application for Low Segment of Analogue TV
SAM	Service Alignment Mode
SAP	Second Audio Program
SAW	Surface Acoustics Wave
SC	SandCastle: two-level pulse derived from sync signals / SCART
SCART	Syndicat des Constructeurs d'Appareils Radiorecepteurs et Televisieurs
SCAVEM	Scan Velocity Modulation
SCL	Serial Clock I2C
SCL-F	CLock Signal on Fast I2C bus
SD	Standard Definition
SDA	Serial Data I2C
SDA-F	Data Signal on Fast I2C bus
SDAM	Service Default / Alignment Mode
SDRAM	Synchronous DRAM

SECAM	SEequence Couleur Avec Memoire: Colour system mainly used in France and East Europe. Colour carriers= 4.406250 MHz and 4.250000 MHz
SEL	Control signal
SIF	Sound Intermediate Frequency
SIMM	Single In-line Memory Module: 80-fold connector between LSP and SSB
SL	Audio Surround Left
SLDP	Smart Local Dooming Prevention (HW and SW)
SMC	Surface Mounted Compoments
SMPS	Switched Mode Power Supply
SND	SouND
SNERT	Synchronous No parity Eight bit Reception and Transmit
SOG	Sync On Green
SOPS	Self Oscillating Power Supply
SOUND-ENABLE	Control line to do hardware mute or un-mute of loudspeakers.
SR	Audio Surround Right
SRAM	Static RAM
SS	Small Screen
ST_BY	Standby
STANDBY (POR)	Signal coming from Main Supply informing the supply is switching off
STATUS	Status signal from pin 8 on SCART connector
STBY	Standby
SURR	Surround (mono) signal
SVHS	Super Video Home System
SW	Software / Subwoofer
SW1	Switch 1
TBD	To Be Defined
THD	Total Harmonic Distortion
TILT	PWM Output signal (variable DC level) to control the picture tilt from the DOP block of the ADOC.

Trinorma	Video standard, combination of PAL N, PAL M, NTSC M
TXT	Teletext
TXTSW	Teletext switch
U_100	U from Feature Box
UART	Universal Asynchronous Receiver Transmitter
UBE	Ultra Bass Enhancement
uC	Micro controller
UI	User Interface
UOC	Ultimate One Chip
uP	Microprocessor
UV	Colour difference signals
V	V_sync
V_100	V from Feature Box
V_2FH	Vertical sync input for the 2fH source.
V_A50	Vertical Acquisition 1fH
V_AMP	Vertical Amplitude DAC output
V_BAT	Main supply for deflection (usually 141 V)
V_D100	Vertical Drive 2fH: vertical sync pulse from deflection
V_DNEG	One of the symmetrical drive signals for the DC frame output stage.
V_DPOS	One of the symmetrical drive signals for the DC frame output stage.
V_OSD	Vertical OSD
VA	Vertical Acquisition
VBI	Vertical Blank Interval
V-chip	Violence chip
VCR	Video Cassette Recorder
VD	Vertical Drive: vertical sync pulse coming from the feature box
VDS	Virtual Dolby Surround
VERT	Vertical Output pulse
VESA	Video Electronics Standards Association

VGA	Video Graphics Array: 640x480 (4:3)
VGND	Video ground
VGUARD	Vertical guard voltage
VIF	Video Intermediate Frequency
VL	Variable Level out: processed audio output toward external amplifier
VMEM	Voltage supplied for EEPROM
VMICRO	Power supply for micro controller
VOL	Volume
VSYNC	Pulse derived of 530 s-circuit behind the HOP, to vertically synchronize the Painter
WD	Watch Dog
WE-NVM	NVM write enable control line.
WS	Wide Screen
WSS	Wide Screen Signaling, used by broadcasters to transmit e.g. PALPLUS and Aspect Ratio
WST	World System Teletext
WXGA	1280x768 (15:9)
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XGA	Extended Graphics Array: 1024x768 (4:3)
XTAL	Quartz crystal
Y	Luminance signal
YC (or Y/C)	Luminance (Y) and Chrominance (C) signal (analogue video encoding format)
YPbPr	Component video (Y= Luminance, Pb/ Pr= Colour difference signals)
YUV	Component video

IC Data Sheets

This section shows the internal block diagrams and pin layouts of ICs that are drawn as 'black boxes' in the electrical diagrams (with the exception of 'memory' and 'logic' ICs).

Diagram M1, Sil 9993 (IC7002)

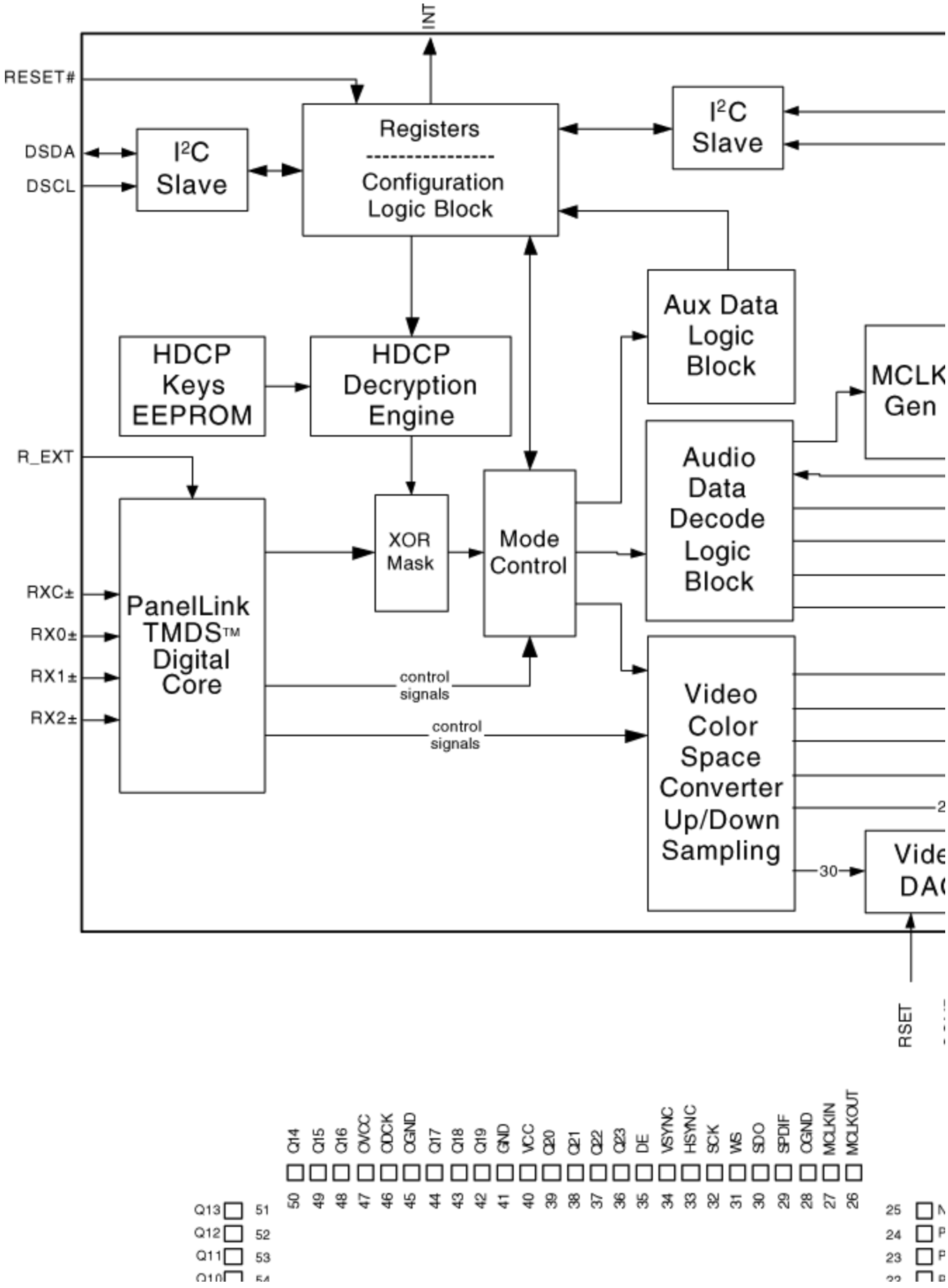
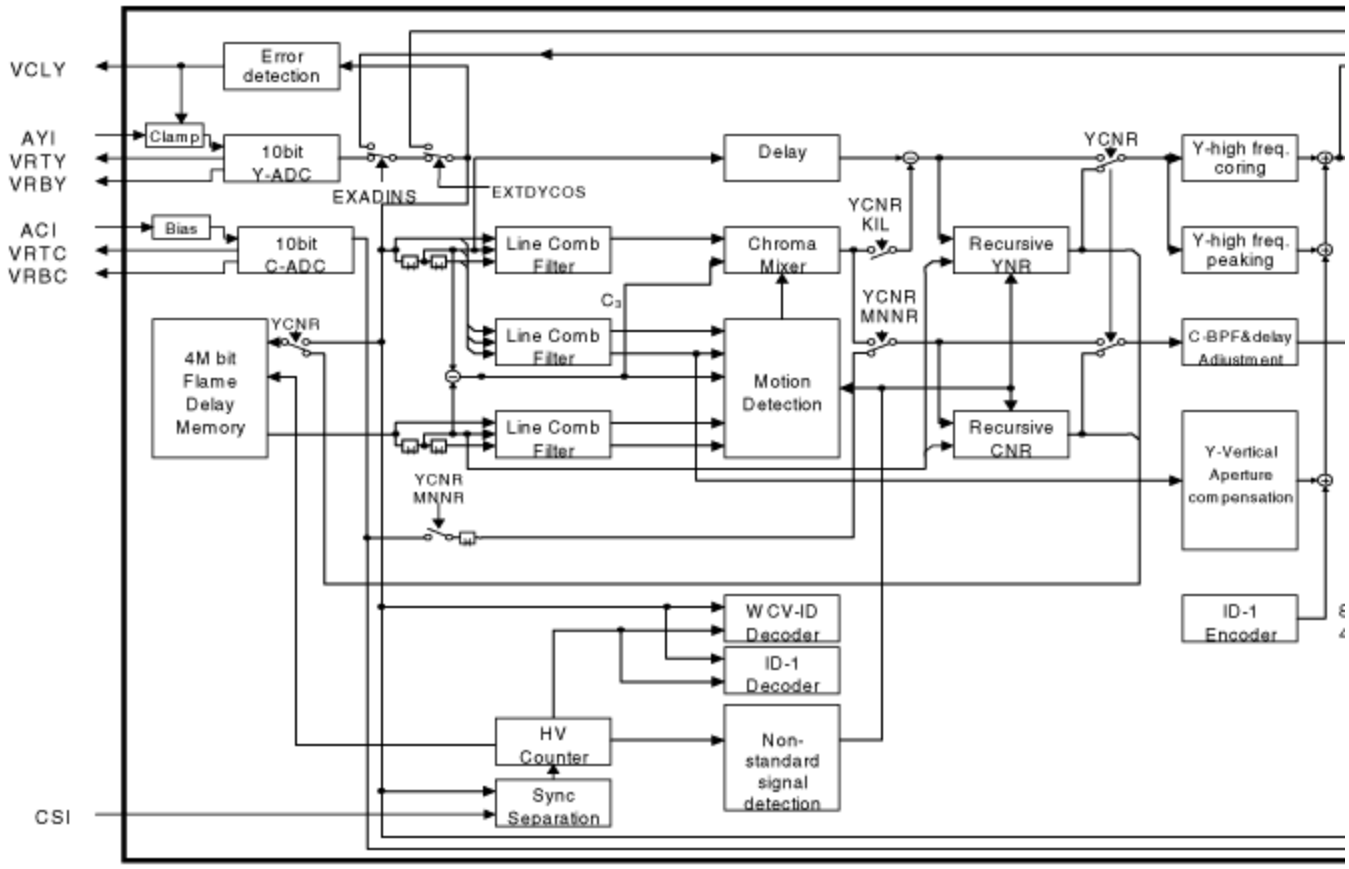

INT
RESET#
DSDA
DSCL
I²C Slave
Registers
Configuration Logic Block
I²C Slave
HDCP Keys EEPROM
HDCP Decryption Engine
Aux Data Logic Block
MCLK Gen
R_EXT
Audio Data Decode Logic Block
XOR Mask
Mode Control
RXC±
RX0±
RX1±
RX2±
PanelLink TMDS™ Digital Core
control signals
control signals
Video Color Space Converter Up/Down Sampling
30
Vide
DA
RSET
Q14 Q15 Q16 OVCC CDCK CGND Q17 Q18 Q19 GND VCC Q20 Q21 Q22 Q23 DE VSYNC HSYNC SCK WS SDO SPDIF CGND MCLKIN MCLKOUT
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
Q13 51
Q12 52
Q11 53
25
24
23

Figure: Internal block diagram and pin configuration

Diagram B17, uPD64083 (IC7823)

Block Diagram



Pin Configuration (Top View)

100-pin plastic QFP (14 20)
PD64083GF-3BA

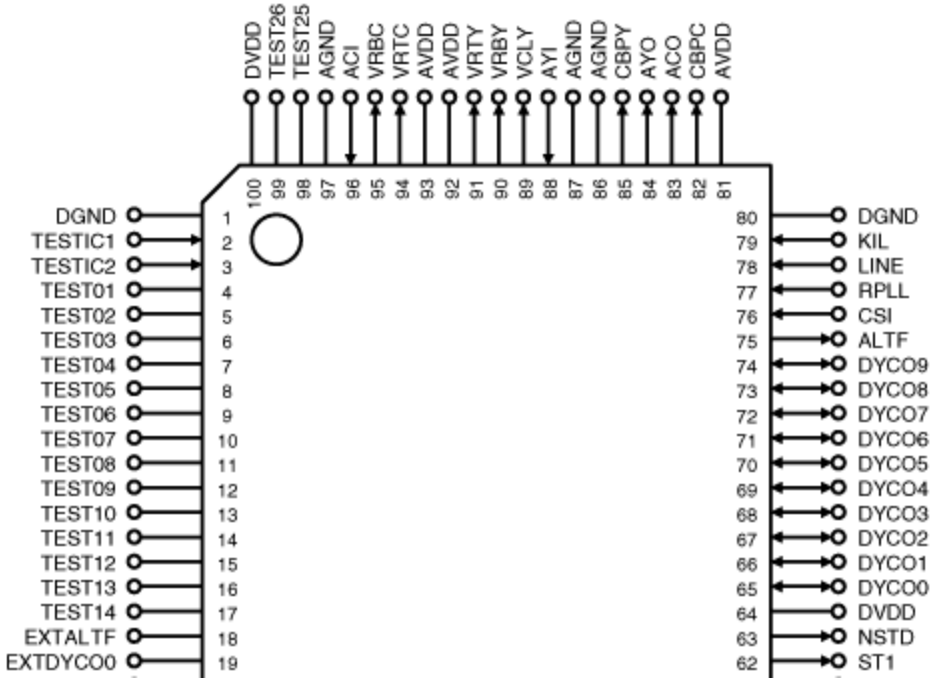


Figure: Internal block diagram and pin configuration

Service Modes, Error Codes, and Fault Finding

Index of this chapter:

1. Test points
2. Service Modes
3. Problems and solving tips (related to CSM)
4. ComPair
5. Error Codes
6. The blinking LED procedure
7. Protections
8. Repair tips
9. Software downloading

Test Points

See chapter 6 ' Block Diagrams, Test point Overview, and Waveforms'.

Perform measurements under the following conditions:

- Service Default Mode.
- Video: color bar signal.
- Audio: 3 kHz left, 1 kHz right.

Service Modes

Service Default Mode (SDM) and Service Alignment Mode (SAM) offer several features for the service technician, while the Customer Service Mode (CSM) is used for communication between a Philips Customer Care Center (P3C) and a customer.

There is also the option of using ComPair, a hardware interface between a computer (see requirements below) and the TV chassis. It offers the ability of structured troubleshooting, test pattern generation, error code reading, software version readout, and software upgrading.
Minimum requirements: a Pentium processor, Windows 95/98, and a CD-ROM drive (see also paragraph 'ComPair').

Service Default Mode (SDM)

Purpose

- To create a pre-defined setting, to get the same measurement results as given in this manual.
- To override SW protections (only when SDM is entered via shorting the SDM pins on the SSB).
- To start the blinking LED procedure.
- Inspection of error buffer, life timer, and software version.

Specifications

- Tuning frequency: 61.25 MHz (channel 3).
- Color system: NTSC M.
- All picture settings at 50 % (brightness, color, contrast).
- All sound settings at 50 %, except volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
  - (Sleep) timer.
  - Child/parental lock.
  - Blue mute.
  - Automatic volume limiter (AVL).
  - Auto switch-off (when no video signal was received for 10 minutes).
  - Skip/blank of non-favorite pre-sets.
  - Hotel or hospital mode.
  - Local keyboard block.
  - Smart modes.
  - Auto store of personal presets.
  - Auto user menu time-out.

How to enter SDM

Use one of the following methods:

- Use the standard RC-transmitter and key in the code '062596', directly followed by the 'MENU' button. **Note:** It is possible that, together with the SDM, the main menu will appear. To switch it 'off', push the 'MENU' button again.
- Short circuit, during switch 'on' of the set, the two solder pads on the SSB with the indication 'FOR SERVICE'. These solder pads are located at the 'tuner' side of the SSB (just above the large BGA IC). **Caution** : If the SDM is entered via these pins, all the software-controlled protections are de-activated for 15 s. When these 15 s are expired, the set will shutdown to protection mode.
- Use the DST-emulation feature of ComPair.

- Use the 'DEFAULT' button on the Dealer Service Tool (RC7150).

After entering this mode:

- 'SDM' will appear in the upper right corner of the screen.
- Also, the error buffer, operating hours, and software version are displayed (can be toggled 'on/off' with the 'STATUS / OSD / [i+]' button).
- Blinking LED procedure will be started.
- All software-controlled protections are overridden for 15 s. When these 15 s are expired, the set will shutdown to protection mode.

Contents of SDM:

- **HRS.** Displays the accumulated total of operation hours (not the standby hours) in a hexadecimal value.
- **SW ID.** Displays the date of the software and the software version of the ROM **Example:** A02EB1_1.00 = AAABBC-X.YY.
  - **AAA** = chassis name.
  - **BB** = region and/or function name: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM, B= Basic, T= Top, P= PAL, N= NTSC, S= Stereo, M= Mono.
  - **C** = the language cluster number.
  - **X.Y** = the software version, where X is the main version number (different numbers are not compatible with one another) and Y is the sub version number (a higher number is always compatible with a lower number).
- **ERR** (followed by maximal 8 errors). The most recent error is displayed at the upper left (for an error explanation see paragraph 'Error Codes').

How to navigate

- When you press the 'MENU' button on the RC transmitter, the set will toggle between the SDM and the normal user menu (with the SDM mode still active in the background).
- When you press the 'STATUS' button on the RC transmitter, the set will toggle only display 'SDM'. This mode is useful when performing measurements, then the OSD info will not generate interference.

How to exit SDM

Use one of the following methods:

- Switch the set to STANDBY via a standard customer RC-transmitter (the error buffer is

erased).
- Via a standard customer RC-transmitter: key in '00'-sequence (the error buffer is **not** erased).

Service Alignment Mode (SAM)

Purpose

- To perform alignments.
- To change option settings.
- To easily identify the used software version.
- To view operation hours.
- To display / clear the error code buffer.

Specifications

- Operating hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.
- Disable service unfriendly modes.

How to enter SAM

Use one of the following methods:

- Via a standard RC transmitter: key in the code '062596' directly followed by the 'STATUS' button.
- Use the DST-emulation feature of ComPair.
- Press the 'ALIGN' button on the DST while the set is in the normal operation

After entering this mode, 'SAM' will appear in the upper right corner of the screen.

Contents of SAM:

- **HRS.** Displays the accumulated total of operation hours (not the standby hours) in a hexadecimal value **Note:** every time the set is switched 'on' by the AC power switch or the RC, the timer is increased by 0.5.

- **SW ID.** Displays the date of the software and the software version of the ROM (**example:** A02UB1-1.00 = AAABBC-X.YY).
  - **AAA** = chassis name.
  - **BB** = region and/or function name: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM, B= Basic, T= Top, P= PAL, N= NTSC, S= Stereo, M= Mono.
  - **C** = the language cluster number.
  - **X.Y** = the software version, where X is the main version number (different numbers are not compatible with one another) and Y is the sub version number (a higher number is always compatible with a lower number).
- **ERR** (followed by maximal 8 errors). The most recent error is displayed at the upper left (for an error explanation see paragraph 'Error Codes').
- **OPTIONS.** Extra feature for Service to set the Option Codes.
- **CLEAR ERRORS.** When you press the 'OK' button, the error buffer is reset.
- **AKB.** Disable (off) or enable (on) the 'black current loop' (AKB= Auto Kine Bias). For Vg2 alignment.
- **TUNER.** This will activate the 'TUNER' alignments sub-menu.
- **WHITE TONE.** This will activate the 'WHITE TONE' alignments sub-menu.
- **GEOMETRY.** This will activate the 'GEOMETRY' alignments sub-menu.
- **SOUND.** This will activate the 'SOUND' alignments sub-menu.
- **SMART SETTINGS.** This will activate the 'SMART SETTINGS' alignments sub-menu.
- **STORE.** This will save the new settings/alignments.
- **EEPROM TEST.** This will report if the SW checksum is OK. Convenient after SW upgrading.
- **VID RAM TEST.** This will check the continuity of the address bus and data bus of the Video RAM.
- **VG2.** This feature is not implemented yet. Do not use.

Note: Alignments are described in chapter 8 'Alignments'.

How to navigate

- In SAM, you can select the menu items with the 'CURSOR UP/DOWN' key on the RC-transmitter. The selected item will be highlighted. When not all menu items fit on the screen, move the 'CURSOR UP/DOWN' key to display the next/previous menu items.
- With the 'CURSOR LEFT/RIGHT' keys, it is possible to:
  - (De) activate the selected menu item.
  - Change the value of the selected menu item.
  - Activate the selected submenu.
- When you press the 'MENU' button on the RC transmitter, the set will toggle between the SAM and the normal user menu (with the SAM mode still active in the background).

How to exit SAM

Use one of the following methods:

- Switch the set to STANDBY via the RC-transmitter (the error buffer is erased).
- Via a standard customer RC-transmitter: key in '00'-sequence (the error buffer is **not** erased).

Customer Service Mode (CSM)

Purpose

When a customer is having problems with his TV-set, he can call his dealer or the Philips helpdesk (P3C). The service technician can than ask the customer to activate the CSM, in order to identify the status of the set. Now, the service technician can judge the severity of the complaint. In many cases, he can advise the customer how to solve the problem, or he can decide if it is necessary to visit the customer.
The CSM is a **read only** mode; therefore, modifications in this mode are not possible.

How to enter CSM

Key in the code '123654' via the standard RC transmitter. **Note:** set must be in 'Widescreen' mode (via button 'PIC SIZE' on the remote control)

Notes :

- Activation of the CSM is only possible if there is no (user) menu on the screen!
- During CSM, sound volume is set to 25% of the scale, 'Smart Sound' is set to 'Theatre' mode, and 'Smart Picture' is set to 'Rich/Movies' mode temporarily to ensure a good picture and sound of the working set. After leaving CSM, the original settings are restored.

How to navigate

By means of the 'CURSOR-DOWN/UP' knob on the RC-transmitter, you can navigate through the menus.

Contents of CSM

The following information is displayed on screen:

- Text 'CSM' on the first line.
- Line number for every line (to make CSM language independent).
- Option code information.
- Configuration information.
- Service-unfriendly modes.

CSM 1

1. **SET TYPE** (if displayed). Type/model number according to the Philips standard.
2. **SOFTWARE.** Software version AAABBC-X.YY.
3. **HOURS ON.** Operating hours (in hexadecimal).
4. **CODE 1.** Shows the contents of the error buffer (the word 'error' may not be used on this screen, instead 'codes' is used).
5. **CODE 2.** Shows the contents of the error buffer (the word 'error' may not be used on this screen, instead 'codes' is used).
6. **OPTION 1.** Option code information (for more details see chapter 8 'Alignments').
7. **OPTION 2.** Option code information (for more details see chapter 8 'Alignments').
8. **OPTION 3.** Option code information (for more details see chapter 8 'Alignments').
9. **OPTION 4.** Option code information (for more details see chapter 8 'Alignments').
10. **SIGNAL.** State of the 'ident' signal.
11. **TIMER** (if present). State of the timer (in 'FEATURE' menu).

CSM 2

1. **CHANNEL** (if present) **.** State of the Child Lock.
2. **PRESET** (if present) **.** State of the Current channel.
3. **HOTELMODE** (if present). Shows if the HOTEL mode is activated.
4. **SOURCE.** Selected source before entry of CSM.
5. **SOUND.** Selected SOUND mode prior entry to CSM.
6. **VOLUME.** Volume level before entry of CSM.
7. **BALANCE.** Balance level before entry of CSM.
8. **BRIGHTNESS.** Brightness level before entry of CSM.
9. **COLOR.** Color level before entry of CSM.
10. **CONTRAST.** Contrast level before entry of CSM.
11. **HUE** (if present) **.** Hue level before entry of CSM.

How to exit CSM

Use one of the following methods:

- After you press a key on the RC-transmitter (with exception of the 'CHANNEL',

'VOLUME' and digit (0-9) keys), or
- After you switch the TV-set 'off' with the AC power switch.
- After 15 min. no RC or local keyboard actions.

Problems and Solving Tips (related to CSM)

Note : Below described problems are all related to the TV settings. The procedures to change the value (or status) of the different settings are described above. New value(s) are automatically stored.

Picture Problems

Picture too dark

1. Press SMART PICTURE several times on the RC. In case the picture improves, increase the 'Brightness' or the 'Contrast' value.
2. Check in CSM lines BRIGHTNESS and/or CONTRAST. If the value of line BRIGHTNESS is low (< 10) or the value of line CONTRAST is low (< 10), increase them. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.

Picture too bright

1. Press SMART PICTURE several times on the RC. In case the picture improves, decrease the 'Brightness' or the 'Contrast' value.
2. Check in CSM lines BRIGHTNESS and/or CONTRAST. If the value of line BRIGHTNESS is high (> 40) or the value of line CONTRAST is high (> 50), decrease the 'Brightness' or the 'Contrast' value. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.

White line around picture elements and text

1. Press SMART PICTURE several times on the RC. In case the picture improves, decrease the 'Sharpness' value.
2. Check in CSM line SHARPNESS. Decrease the 'Sharpness' value. The new value is automatically stored for all TV channels. The new value is automatically stored (in 'personal' pre-set) for all TV channels.

No picture

Check in CSM line 7. In case this line shows NO SIGNAL, check the aerial cable/aerial system.

Blue picture

No proper signal is received. Check the aerial cable/aerial system.

Blue picture and/or unstable picture

A scrambled or decoded signal is received.

Black and white picture

Check in CSM line COLOR. In case the value is low (< 10), increase the 'Color' value. The new value is automatically stored for all TV channels.

No colors/color lines around picture elements or colors not correct or unstable picture

1. Check in CSM line SYSTEM. If a 'strange' system pops up, something has gone wrong during installation. Re-install the channel.

Menu text not sharp enough

1. Press 'SMART PICTURE'. In case picture improves, decrease the 'Contrast' value. The new value(s) are automatically stored for all TV channels.
2. Check in CSM line CONTRAST. If the value of this line is high (> 50), decrease the 'Contrast' value.

Sound Problems

No sound from left and right speaker

Check in CSM line VOLUME. If the value is low, increase the value of 'Volume'. The new value (s) are automatically stored (in 'personal' pre-set) for all TV channels.

Sound too loud for left and right speaker

Check in CSM line VOLUME. If the value is low, decrease the value of 'Volume'. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.

ComPair

Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:
ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
ComPair allows very detailed diagnostics (on I2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I2C commands yourself because ComPair takes care of this.
ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial (or RS232) cable.
For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector.

The ComPair faultfinding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- **Automatic** (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I2C level. ComPair can access the I2C bus of the television. ComPair can send and receive I2C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I2C busses of the TV-set.
- **Manually** (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extends. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen give a picture? Click on the correct answer: YES / NO) and showing you examples (e.g. Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:

- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the Dealer Service Tool (DST).
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink. **Example** : *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Mono-carrier* .
  - Click on the 'Panel' hyperlink to automatically show the PWB with a highlighted capacitor C2568.
  - Click on the 'Schematic' hyperlink to automatically show the position of the highlighted capacitor.

Stepwise Start-up

This is realized via ComPair and is very helpful when a **protection** is activated (see also chapter 'Protections').
Under normal circumstances, a fault in the power supply, or an error during start-up, will switch the television to protection mode. ComPair can take over the initialization of the television. In this way, it is possible to distinguish which part of the start-up routine (hence which circuitry) is causing the problem.
Take notice that the transition between two steps can take some time, so give the set some time to reach a stable state. During the transition time, the LED can blink strangely.

On entering Service mode, protections and other errors can be trapped by powering the TV in stepwise fashion as explained below. The 'stepwise start-up' mode is done in the specified sequence. Before entering this mode, all the protections are disabled and are only enabled step-by-step, to trap the errors more appropriately.

The following steps are involved.
Step 0: Standby.

- Pre-condition: The set is in protection mode.
- Post-condition: The set is switched to the stepwise start-up mode. Only the necessary Standby Supply is present, all other supplies are switched 'off'.

Step 1: Power 'on'.

- Pre-condition: All protections are disabled, sound amplifiers are muted, and general initialization is done.

- Post-condition: 8V and 5V supplies are 'on'. Degaussing is 'on' and switched 'off' after 3 s. The supply fault protections are enabled.

Step 2: Initialized.

- Pre-condition: Step 1 is done. No supply protection faults are detected.
- Post-condition: ADOC, MPIF, and Tuner components are initialized.

Step 3: Deflection 'on'.

- Pre-condition: Step 2 is done. No protection faults detected.
- Post-condition: Deflection is switched 'on'. The horizontal deflection fault protections are enabled.

Step 4: TV 'on'.

- Pre-condition: Step 3 is done. No protection faults detected.
- Post-condition: Picture tube is switched 'on'. Sound amplifiers are demuted. The X-ray/beam current fault protections are enabled.

Note : When the set is in stepwise mode and, due to stepping-up, a protection is activated, the set will really go into protection (blinking LED). The set will not leave the stepwise-mode however. If state X is the state where the set went to protection, stepwise start-up will return to state X-1. At state (X-1) diagnostic measurements can be performed. Also, in the short time, the set is in state X but not in protection, you can also do some measurements.

How To Connect

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
3. Connect the AC power adapter to the supply connector (marked with 'POWER 9V DC') of the ComPair interface.
4. Switch the ComPair interface 'off'.
5. Switch the television set 'off' with the AC power switch.
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I2C') and the ComPair connector at the rear side of the TV (for its location see figure 'Top view LSP' in chapter 'Alignments').
7. Plug the AC power adapter in a AC power outlet, and switch the interface 'on'. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.

8. Start the ComPair program and read the 'Introduction' chapter.

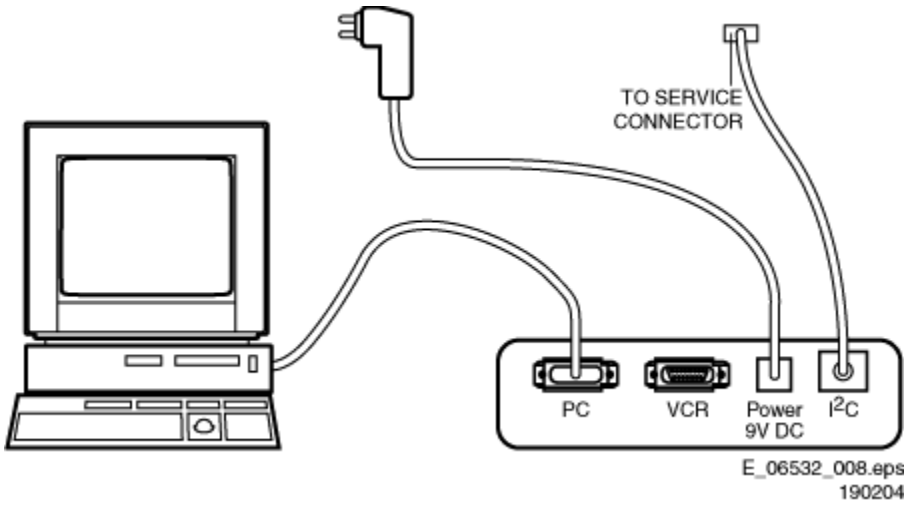


Figure: ComPair Interface connection

How To Order

ComPair order codes:

- ComPair Software: ST4191.
- ComPair Interface Box: 4822 727 21631.
- AC Adapter: T405-ND.
- ComPair Quick Start Guide: ST4190.

Note: If you encounter any problems, contact your local support desk.

Error Codes

Introduction

The error code buffer contains all detected errors since the last time the buffer was erased.
The buffer is written from left to right, new errors are logged at the left side, and all other errors shift one position to the right.
When an error has occurred, the error is added to the list of errors, provided the list is not full or the error is a protection error.

When an error occurs and the error buffer is full, then the new error is not added, and the error buffer stays intact (history is maintained), except when the error is a protection error.
To prevent that an occasional error stays in the list forever, the error is removed from the list after 50+ operation hours.
When multiple errors occur (errors occurred within a short time span), there is a high probability that there is some relation between them.

How to read the Error Buffer

Use one of the following methods:

- On screen via the SAM (only if you have a picture). Examples:
  - **0 0 0 0** : No errors detected
  - **6 0 0 0** : Error code 6 is the last and only detected error
  - **9 6 0 0** : Error code 6 was first detected and error code 9 is the last detected error
- Via the blinking LED procedure (when you have no picture). See next paragraph.
- Via ComPair.

How to clear the Error Buffer

Use **one** of the following methods:

- By activation of the 'CLEAR ERRORS' command in the SAM menu.
- With a normal RC, key in sequence 'MUTE' followed by '062599' and 'OK'.
- When you transmit the commands 'DIAGNOSE' - '99' - 'OK' with ComPair (or with a DST).
- If the content of the error buffer has not changed for 50+ hours, it resets automatically.

Error Codes

Error codes are required to indicate failures in the TV set. In principle a unique error is available for every:

- I2C device error.
- I2C bus error (for every bus containing two or more I2C devices).
- Protection error (e.g. +8V protection or Horizontal protection).
- Error not related to an I2C device, but of importance (e.g. BC-loop, RAM error).

Table: Error Code Table

Error	Description
0	No error
1	Horizontal Protection (via NOHFB bit in ADOC)
3	+8V error (missing/protection active by checking MPIF ASUP bit))
4	X-ray/High beam current protection signal (via XPROT bit in ADOC)
5	Hardware Protection is active
7	Under-voltage protection
11	MPIF I2C communication failure / MPIF test failed
12	BC-loop not stabilised within the time limit (i.e. after timer is expired)
13	NVM I2C communication failure
14	Main tuner I2C failure UV13xx
15	HDMI Panel Link Receiver
17	3D Combfilter I2C communication failure
18	PIP Tuner I2C failure
21	PIP IF demodulator IC TDA988x communication failed (only for PIP/DW sets)
22	Flash over protection error (to register CRT flash-overs, via FPR bit in ADOC)

Service tips:

- In case of non-intermittent faults, clear the error buffer before you begin the repair. This to ensure that old error codes are no longer present. Before clearing the buffer, write down the content, as this history can give you significant information.
- If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error code and not the actual cause (e.g., a fault in the protection detection circuitry can also lead to a protection).

The Blinking LED Procedure

Introduction

Via this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful for fault finding, when there is no picture.

When the SDM is entered, the front LED will show (blink) the contents of the error-buffer. Error-codes > 10 are shown as follows:

1. A long blink of 750 ms (which is an indication of the decimal digit),
2. A pause of 1500 ms,
3. 'n' short blinks (where 'n' = 1 - 9),
4. When all the error-codes are displayed, the sequence finishes with a LED blink of 3000 ms,
5. The sequence starts again.

Example: Error 12 9 6 0 0.
After activation of the SDM, the front LED will show:

1. 1 long blink of 750 ms (which is an indication of the decimal digit) followed by a pause of 1500 ms,
2. 2 short blinks of 250 ms, followed by a pause of 3000 ms,
3. 9 short blinks of 250 ms, followed by a pause of 3000 ms,
4. 6 short blinks of 250 ms, followed by a pause of 3000 ms,
5. 1 long blink of 3000 ms to finish the sequence,
6. The sequence starts again.

How to Enter

Use one of the following methods:

- Enter the SDM (only via soldering pads marked 'FOR SERVICE' on the SSB). The blinking front LED will show the entire contents of the error buffer (this works in 'normal operation' mode and in 'protection' mode). In order to avoid confusion with RC5 signal reception blinking, this LED blinking procedure is terminated when an RC5 command is received.
- Transmit the commands 'MUTE', '06250x', and 'OK' with a normal RC (where 'x' is the position in the error buffer that has to be displayed). With x= 1, the last detected error is shown, x= 2 the second last error, etc.... When x= 0, all errors are shown.
- 'DIAGNOSE X' with the DST (where 'x' is the position in the error buffer that has to be displayed). With x= 1, the last detected error is shown, x= 2 the second last error, etc....

When x= 0, all errors are shown.

Note: It can take some seconds before the blinking LED starts.

Protections

Introduction

Fault protections are introduced to avoid unacceptable temperature rising and burning hazards. If a fault situation is detected, an error code will be generated and if necessary, the set is put in protection mode.
The protection mode is indicated by the blinking of the front LED at a frequency of 3 Hz (or by a coded blinking in special cases). For the customer, it is made impossible to switch 'on' the set during a protection.
It is possible to determine the type of fault by interpreting the blinking pattern of the LED indicator. It is also possible to read out the error codes from the NVM via ComPair. It is possible to de-activate the protection states in Service Default Mode.

The following protections are implemented:

Table: Protections overview

Protection	Detection method	Bit name	Detection
Under Voltage	Via ADC (KB)	ADC (KB)	ADC input
+8V Supply	Via MPIF_IRQ	ASUP	MPIF internal register
Horizontal fly-back	Via interrupts	NOHFB	ADOC internal register (DOP)
X-ray	Via interrupts	XPROT	ADOC internal register (DOP)
Beam Current	Via interrupts	BCF	ADOC internal register (DOP)
Flash	Hardware ctrl	-	Hardware
Arc	Hardware ctrl	-	Hardware
Vertical	Hardware ctrl	-	Hardware

East/West	Hardware ctrl	-	Hardware
Bridge coil	Hardware ctrl	-	Hardware

The protections are split up in the following order:

- I2C related protections.
- ADOC related protections (via polling on I/O pins or via algorithms).
- DOP related protections (mainly for deflection items).
- Hardware errors that are not sensed by the OTC (e.g. vertical flyback protection, bridge coil protection, E/W protection, arcing protection).

All faults detected are re-checked five times before the protection mode is triggered. It should be noted that supply fault detection/protection must be enabled only after the chassis power supply has been established. Likewise, after the line drive starts, the deflection detection/protection must be enabled. To prevent false activation of protection mode during power mode transitions, interrupts related to supply fault and deflection fault are disabled.

I2C Related Protections

In normal operation, some registers of the I2C controlled ICs are refreshed every 200 ms. During this sequence, the I2C busses and the I2C ICs are checked.
An I2C protection will take place if the SDA and SCL lines are short-circuited to ground, or to each other. An I2C error will also occur, if the power supply of the IC is missing.

ADOC Related Protections

If a protection is detected at an ADOC input, the uP will start to scan all protection inputs every 200 ms for five times. If the protection on one of the inputs is still active after 1 s, the microprocessor will put the set in the protection mode. Before the scanning is started, a so-called 'ESD refresh' is carried out. This is done, because the interrupt on one of the inputs is possibly caused either by a flash or by ESD. As a flash or ESD can influence IC settings, the key ICs are initialized again, to ensure the normal picture and sound conditions of the set.

Under Voltage Protection

The under voltage protection is needed due to the non-isolated chassis architecture used in A02. Whenever there is a short circuit in the Deflection yoke coil or in the Audio power supply, the averaged Horizontal Flyback Voltage (HFB_XRAY_PROT) will fall. After signal conditioning, this voltage is fed to the 'KEYBOARD_ADC' input. When this input of the MIPS

controller is less than a certain level, the under voltage protection is activated. This is done by the normal keyboard polling mechanism.
The protection mode is activated after five consecutive occurrences. Response time required is 2 s. This is to avoid set going to under voltage protection mode during start up, since the HFB will only be stable w.r.t. mains on for about 1.6 s.

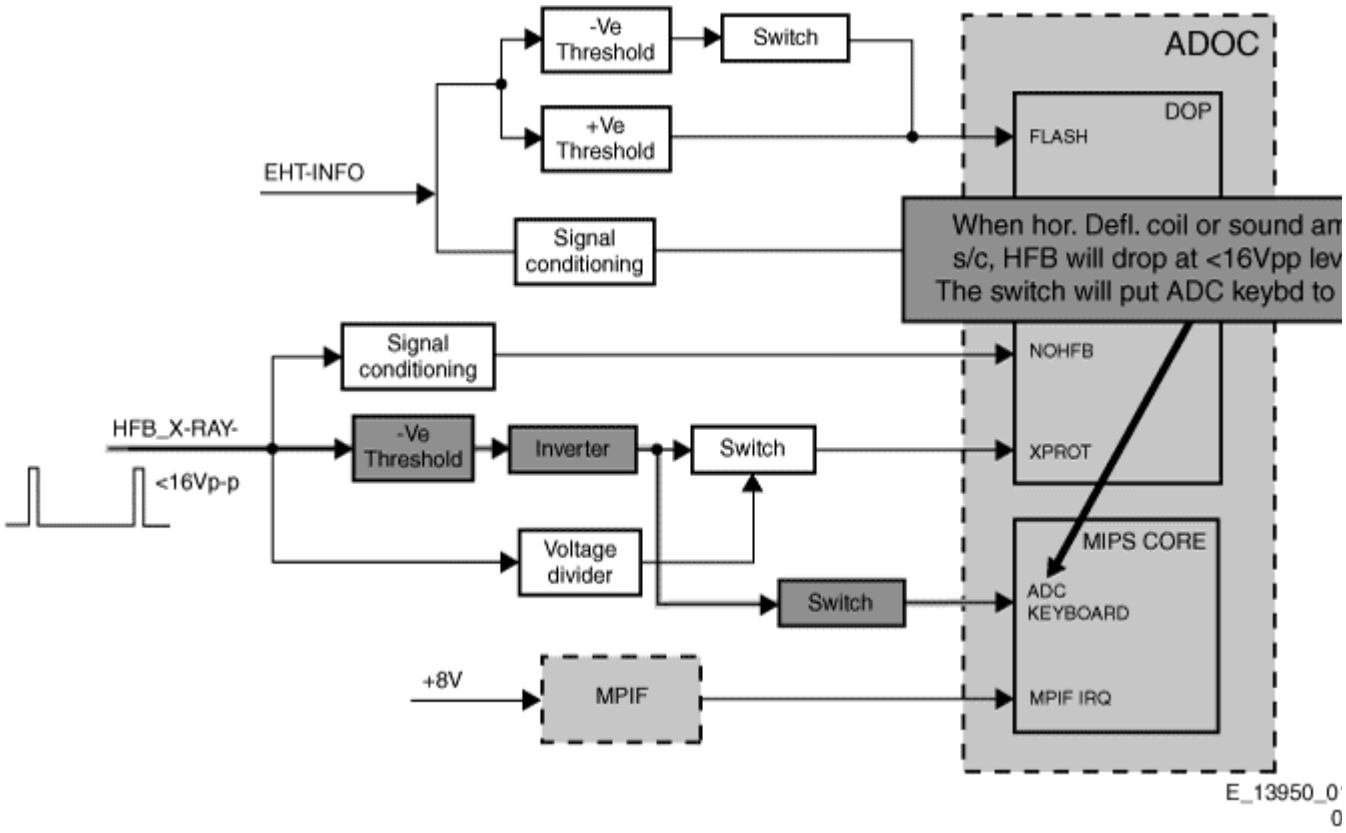


Figure: Under Voltage Protection

+8V Protection

Hardware is employed for the detection of +8V supply fault. A hardware interrupt (MPIF-IRQ) is generated by the MPIF when the +8V supply falls below the IC specification.
To avoid false detection, the corresponding interrupt sub routine checks the status of 'ASUP' bit in the MPIF status register for five times consecutively with an interval of 200 ms before triggering the protection mode. Response time required is 1.2 s.

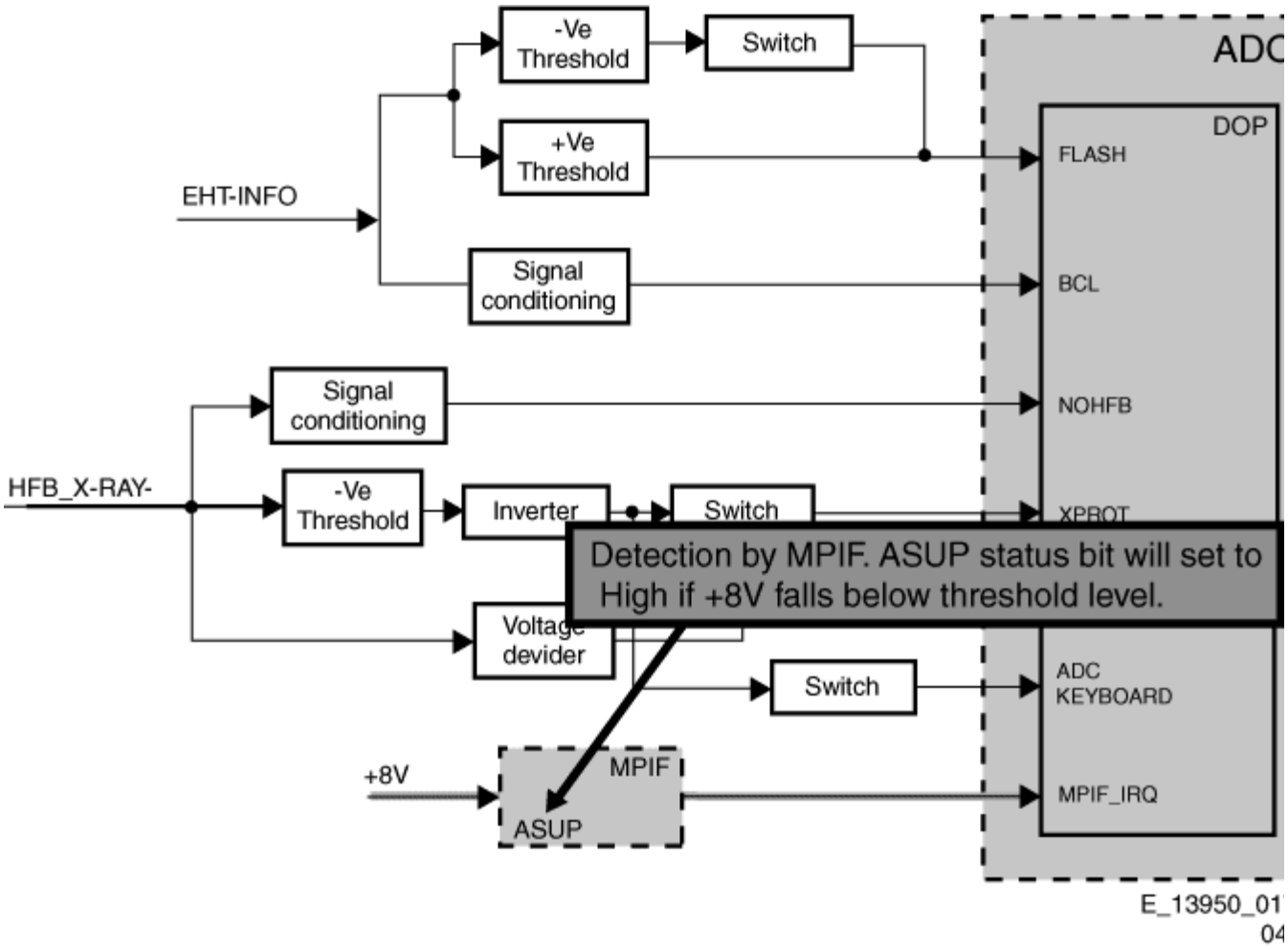


Figure: +8V Protection

DOP Related Protections

The uP reads every 200 ms the status register of the DOP (via the I2C bus). If a protection signal is detected on one of the inputs of the DOP, the relevant error bit in the register is set to 'high'. If this error bit is still 'high' after 1 s, the OTC will store the error code in the error buffer of the NVM and, depending on the relevancy of the error bit, the set will either go into the protection mode or not.

Horizontal Fly Back Protection

Hardware is employed for the detection of a horizontal deflection fault. The DOP core generates a hardware interrupt when consecutive three horizontal flyback pulses are not received at the HFB input of the DOP block of the ADOC IC.
To avoid false detection, the corresponding interrupt sub routine checks the status of 'NOHFB'

status bit in the DOP core for five times consecutively with an interval of 50 ms before triggering the protection mode. The response time for this protection needed is 300 ms.

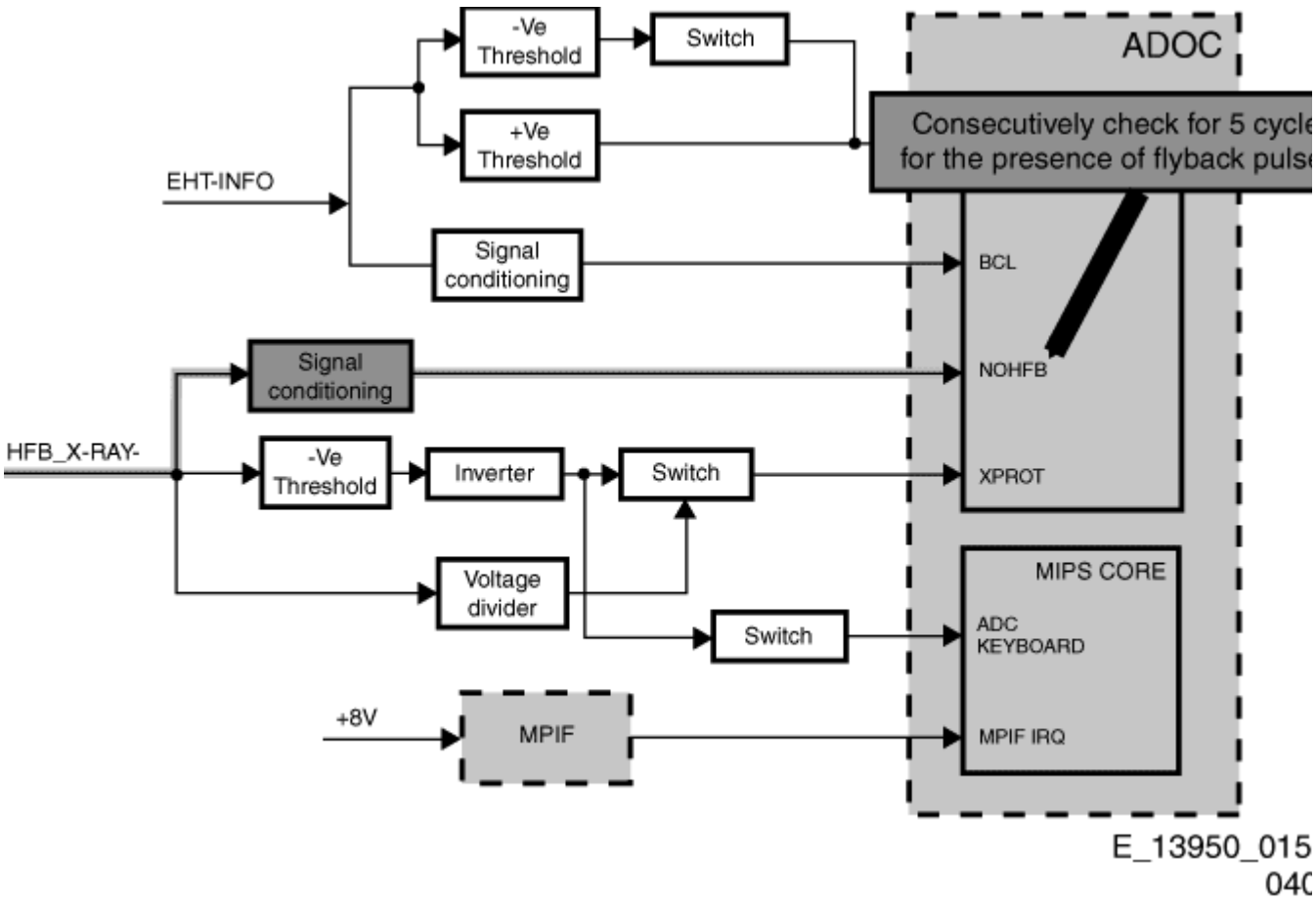


Figure: Horizontal Fly Back Protection

X-Ray Protection (Over Voltage, USA only)

Hardware is employed for the detection of X-ray fault. A hardware interrupt is generated by the DOP core when the 'XPROT' input of ADOC IC is pulled 'HIGH' (flyback pulses are > 27 V_pp). To avoid false detection, the corresponding interrupt sub routine checks the status of 'XPROT' bit in DOP core for five times consecutively with an interval of 50 ms before triggering the protection mode. It should be noted that the 'XPROT' status is not reset on reading. It should be cleared by the software explicitly.
Once the XRAY protection status is confirmed, the 'PRD' bit has to be set to '1' by software. This enables an automatic stop of the H-out via Slow Stop initiated by auto-clearing the DFL bit. Now, the protection mode is activated.

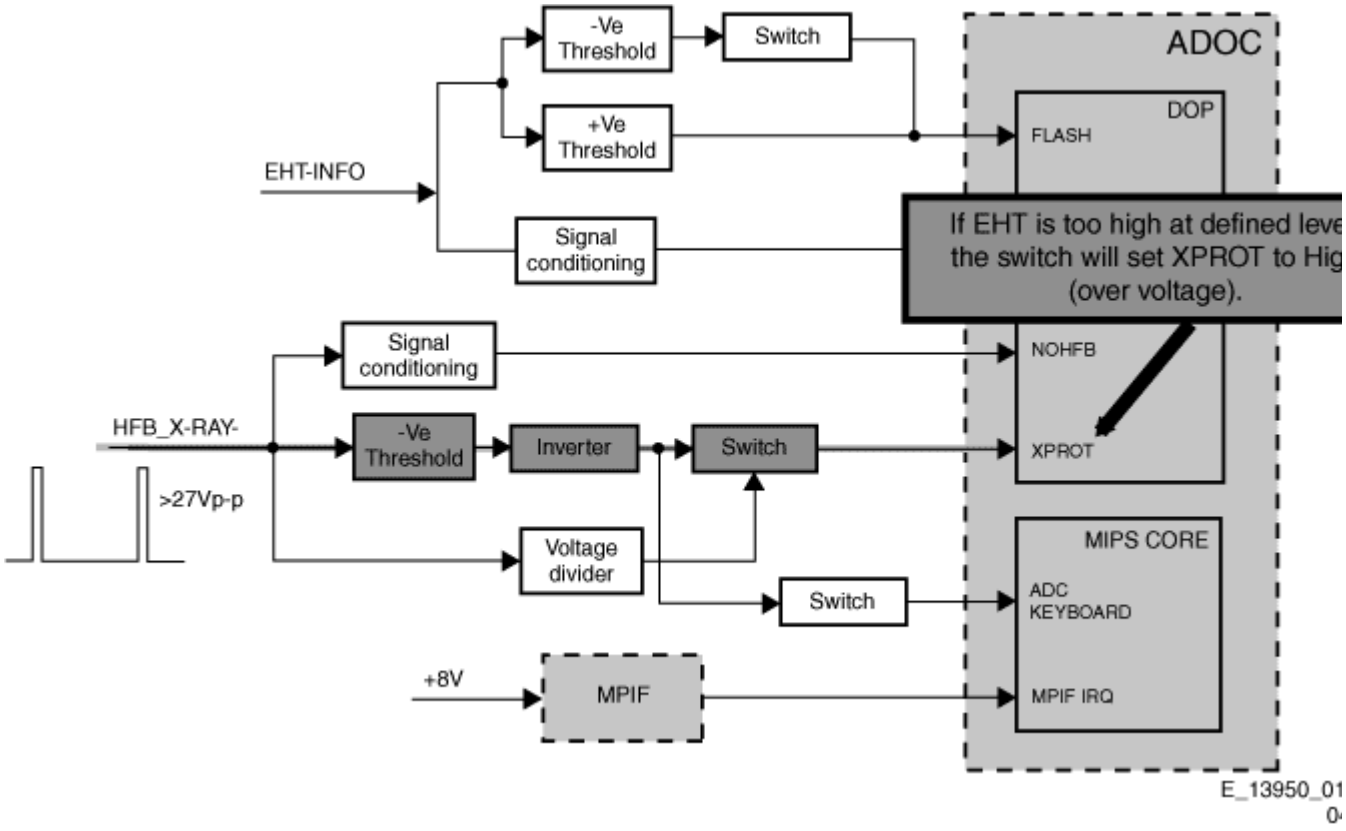


Figure: X-Ray Protection

Beam Current Protection

A hardware interrupt is generated by the DOP core when the current at the BCL input of the ADOC IC exceeds the limit.
To avoid false detection, the corresponding interrupt sub routine checks the status of 'BCF' bit in DOP core for five times consecutively with an interval of 50 ms before triggering the protection mode. Once the BCL protection status is confirmed, the 'PRD' bit has to be set to '1' by software. This enables an automatic stop of the H-out via Slow Stop initiated by auto-clearing the 'DFL' bit. Now, the protection mode is activated.

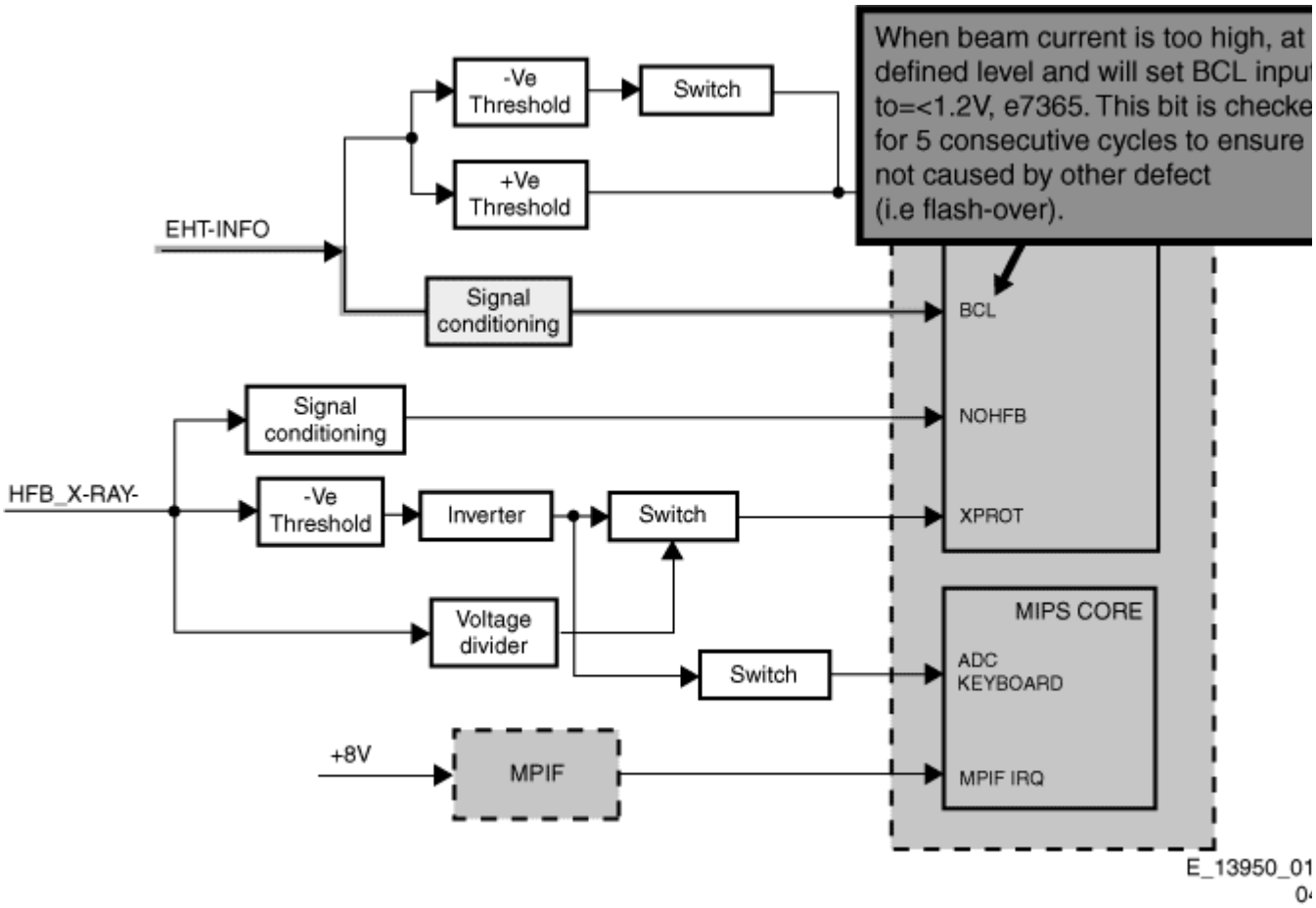


Figure: Beam Current Protection

Flash Protection

Flash detection is used to shutdown the set only if the Flash occurs more than five times and is persistent. Therefore, this is a method to protect the set from undue electrical stress because of picture tube flashes. The flash detector circuitry uses the 'EHT_INFO' signal as input. Its output is connected to the 'FLASH' input of the DOP block of the ADOC.
When the 'FLASH' input is pulled 'HIGH', the ADOCs horizontal drive output stops immediately and the 'FPR' status bit of the DOP core is set to '1'. The status is latched until readout. With the absence of any other disturbances, the horizontal drive output will restart after the 'FLASH' input is 'LOW' again. No software interaction is required in this case. The 'FPR' bit has to be readout by polling at an interval of 500 ms. If the 'FPR' status bit has been set to '1' for more than five times consecutively, then the protection mode is triggered. Setting the 'FPR' bit for less than five times by the 'FLASH' input does not trigger the protection mode (shutting down of the H-drive is enough).

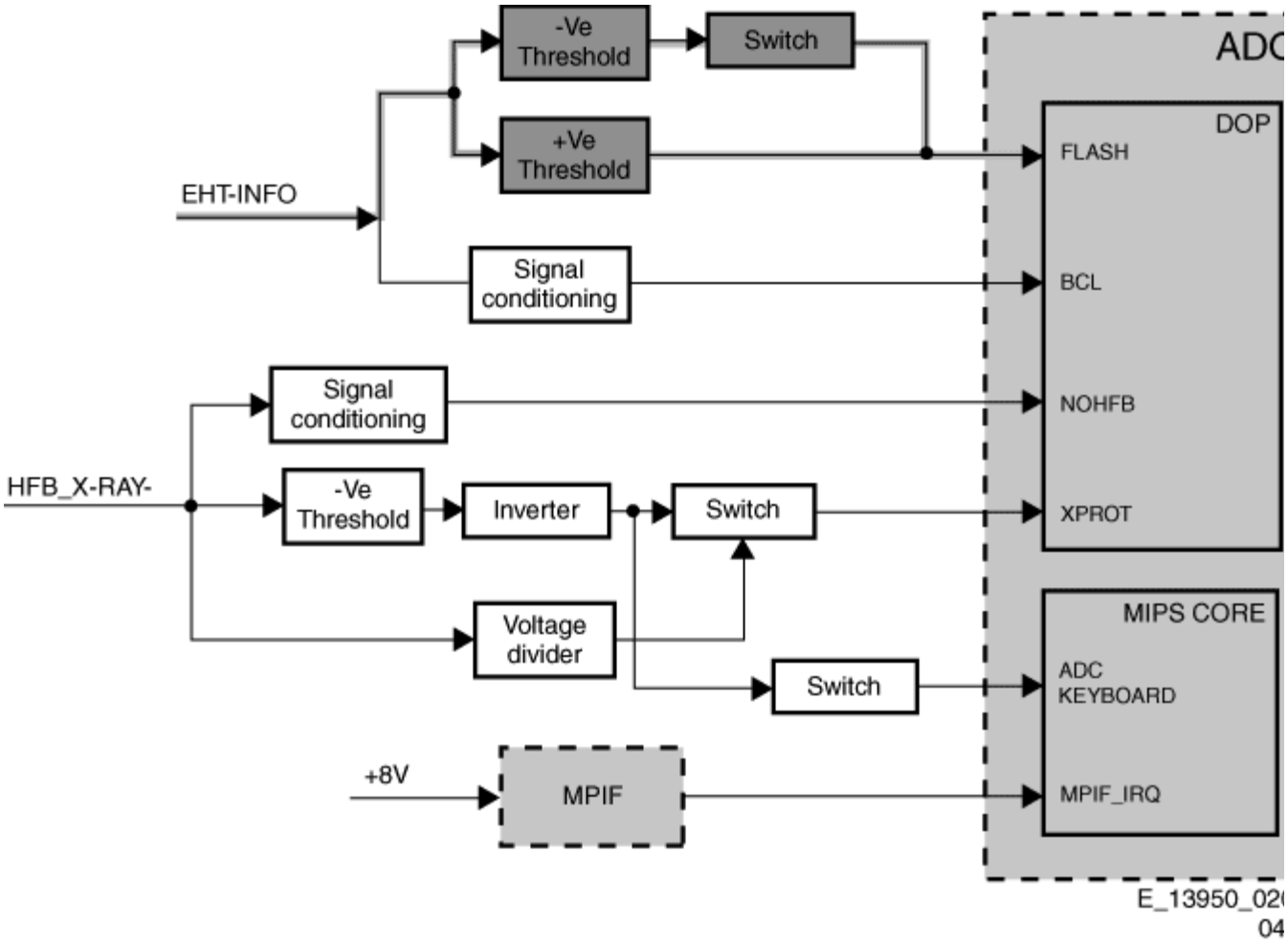


Figure: Flash Protection

Hardware Related Protections

Due to the architecture (read: 'hot' deflection), some protections cannot be sensed by the microprocessor. These protections will lead to a protection on set level (Standby mode and blinking LED).

Arc Protection

If there are 'open' connections (e.g. bad solder joints) in the high-energy deflection circuitry, this can lead to damaging effects (read: fire). For that reason, the E/W current is sensed (via 3479//3480). If this current becomes too high, the 'thyristor' circuit (TS7653 and TS7654) is triggered. TS7442 is switched 'on' and TS7443 is forced into conduction. The 'SUP-ENABLE' signal is shorted now to ground level, which will force the Main Power Supply to Standby mode. This prevents further arcing.

Vertical Protection

If the frame stage generates no pulses, TS7641 will block. TS7443 is now switched 'on', which will lead to Standby mode. Therefore, in normal operation condition, TS7641 and TS7652 are conducting, while TS7443 is blocked.

EW protection

Several faults in the defection circuit can cause excessive currents through MOSFET 7480. The temperature of this device can become too high, causing an unsafe situation. The power supply is shut down in the above-mentioned way.
Caution: All hardware deflection protections can be disabled by interrupting R3403 on the LSP.
However, be careful : unsafe situations (heat) can occur or the picture tube can be destroyed.

Bridge coil protection

According safety regulations, every coil may be short-circuited. By doing this in the secondary winding of coil L5422, high currents will flow in the winding. With no safety circuit, the coil will begin to burn soon.
This is sensed via the 'EW' signal going to the base of TS7652 (via R3495 and D6499). In a normal situation, the voltage on C2498 (diagram A4) is high and TS7652 is conducting. When bridge coil 5422 (diagram A3) is short circuited, the voltage on C2498 changes to low, which will block TS7652. In this case, also TS7641 will block and the voltage on 2642 will rise until TS7443 is forced in conduction. The 'SUP-ENABLE' signal (in normal operating condition -20 V) is shorted now to ground level, which will force the Main Power Supply to Standby mode.
Note: Maximum EW width settings can also cause a protection.

Repair tips

Miscellaneous

The relay you hear when you switch the set 'on' (from Standby or via the AC power switch), is from the degaussing circuitry. It is **not** used for switching the Power Supply (as done in the MG-chassis).

- Where the circuitry was too 'crowded' for service printing, you can find the correct location on the 'test point overviews' in this manual.
- **A very large part of the LSP is** 'hot', such as:
  - The primary part of the Standby Supply.
  - The whole Main supply (except for the secondary Audio supply).
  - And the complete deflection circuitry (so notice that the deflection coil is hot!).

Start-up/Shut-down Sequence

For a detailed description, see chapter 9 ' Circuit Descriptions, Abbreviation List, and IC Data Sheets'.

ComPair

This chassis does not have an IR transmitting LED (as in MG-sets). Therefore, a 'Service' (ComPair) connector is implemented at the rear side of the set, which is directly accessible. In addition to this, there is also a blinking LED procedure to show the contents of the error buffer.

When you use ComPair, you have the possibility to activate a 'stepwise start-up' mode. With this mode, you can initiate the start-up sequence step by step. This also means that in certain steps, some protections are not activated. This is sometimes very convenient during repair.

Protections

Activating SDM via the 'service pads' will overrule the processor-controlled protections, but **not** the hardware protections.
Caution: When doing this, the service technician must know what he is doing, as it could lead to damaging the set.

The 'ARC'- and/or 'BRIDGECOIL' protection are hardly ever triggered, however:

- When you suspect the 'ARC' protection, look for bad solder joints and smell. By interrupting resistor 3497, this protection is disabled (special attention needed!).
- When you suspect the 'BRIDGECOIL' protection, which can also be due to a too wide picture amplitude, shorten G and S of the E/W MOSFET 7480. This will disable the protection. You will now have minimal horizontal amplitude. Re-align the horizontal amplitude in the SAM menu and remove the G/S short of TS7480.

Main Supply

1. Replace FET 7504 and zener 6505.
2. Disconnect the SSP panel.
3. Short B and E of TS7529, in order to put the Main Supply in 'on'-mode (TS7529 is blocking then).
   Caution: To prevent that R3403 and TS7443 will be damaged, **first disable the HW-protection of the deflection circuit.** Therefore, short-circuit C2642 on the LSP (diagram A4).

4. Attach a load of 500 ohm to the V_BAT capacitor C2515 (the supply can not work without a minimum load).
5. Use a variac, and slowly increase the V_MAINS. Measure over sensing resistors R3514//15, if a nice sawtooth voltage becomes available.
6. Also, measure the V_BAT. This may never exceed +141 V. If it does, there is something wrong in the feedback circuitry (e.g. regulator 7506).

Note: Be careful when measuring on the gate of FET TS7504. This circuitry is very high ohmic and can easily be damaged (first connect ground to measuring equipment, than measure the gate).

Frame Deflection

Caution: When the Frame Deflection circuitry is suspected, one must be careful. Because there is a DC-voltage on the frame deflection, **the beam current could damage the CRT neck, leading to a defective CRT** .

To prevent this from happening, you must:

1. Interrupt the resistors 3403 and 3404 on the CRT panel (diagram F), in order to remove the 'filament' voltage from the tube (no beam current, so no chance of destroying the CRT).
2. Interrupt resistor 3403 on the LSP (diagram A4) to disable the 'SUP-ENABLE' line.
3. Measure with a multi-meter, or better with an oscilloscope, the functionality of the Frame stage.
4. After you have found the cause, exchange the defective component (e.g. TDA8177), and re-solder the interrupted resistors.

Table: Repair tips

Phenomenon	Possible Cause	Repair tip
No picture, no LED.	Standby Supply defective.	Measure circuitry (see diagram A2). Start at test-point A19.When the Mains switch is 'on', this voltage must always be available.
		You have no picture, so: read the error buffer via ComPair

No picture, LED blinking at 3 Hz.	Set is in protection due to various causes. For error codes see error-code list.	(error buffer is accessible when set is in protection, ComPair-file will guide you to this). Read the blinking LED information via standard remote command mute-06250x-ok. Or you read the error code sequence via standard remote command mute-062500-ok. When you have found the error, check the circuitry related to the supply voltage and I2C-communication or the circuitry that triggers the protection.
No picture, LED blinking with code 8-8-8-etc or 9-9-9-etc.	No communication on slow I2C- or fast I2C-bus.	As processor cannot communicate with one of the 2 busses it the standby-LED spontaneously starts blinking 8-8-8-etc or 9-9-9-etc... If in the error buffer somewhere is an error 8 or 9, these will have the highest priority starting the mentioned blinking. Measure dependent of the error on the I2C-bus which device is loading the bus (use the I2C-overview)
No picture, LED blinking with code 13-13-13-etc.	No communication on NVM-I2C bus to the uP.	As the uP cannot communicate with the NVM I2C bus, it spontaneously starts blinking 13-13-13-etc. Note: when there is no access to the NVM, a lot of picture setting can go wrong.
No picture, no sound. Set is making audible squeaking sound	Supply is possibly in hiccup-mode, which is audible via a squeaking supply	Possible causes: V_BAT is shorted (caused by short circuited line transistor 7421), the sound winding is shorted (amplifier is shorting the power supply lines), or D6514 is shorted (due to a too high V_BAT). Remove excessive load, to see what causes the

	transformer.	failure, or check feedback circuit. See repair tip 'Main Power Supply' (supply needs a minimal load).
No picture, no sound. Front LED works fine	Supply does not work correctly.	If e.g. V_BAT is only about 90 V, it is possible that the regulator IC (7506) is defective.
No RC-reception. Front LED does not echo RC-commands.	uP circuitry or RC-receiver is defective.	In case the set does react on a local keyboard operation, you must check the RC-receiver circuitry (diagram J).
Relay (degaussing) is not audible, when set is switched from 'off' or 'standby' to 'on'.	uP is not working correctly. When line 'DEGAUS' is low, the degaussing must be activated.	Check RESET-circuitry (IC7581 on diagram B11). Check the level on line 'DEGAUS' when you switch the set 'on'. Signal must be low initially and go to high after approx. 12 s.
Picture is rotated.	Rotation circuitry (if present) on diagram A5, or related supply to it, malfunctions.	Measure test points on diagram A5.
Picture is continuously switching 'off' and 'on', showing heavy 'switch' spots (set does not go into protection).	200 V is missing on CRT panel.	Probably a bad connection from LSP connector 1424 to CRT connector 1424 (diagram F), or an interruption of the 200 V supplies line (e.g. R3341 on circuit F1 is interrupted).
Picture is not sharp.	Focus is possibly mis-aligned or SCAVEM-circuitry does not work correctly.	Re-align the 'FOCUS' potmeter on the Line Output Transformer, or check the SCAVEM circuitry on the CRT-panel (diagram F). It is also possible that the DAF circuitry is defective (see diagram I). Check the V_dc values.

Picture is distorted.	Check video-path in Service Default Mode.	Investigate whether there is an error code present in the error buffer. In case there is one, check the I2C-bus and/or supply lines (see overview supply lines). Measure and check signal path Tuner-MPIF-ADOC-RGB amplifier. In case it is a geometry issue, check on diagram A4 opto-coupler 7482, OpAmps 7440/7450 and the Frame circuitry alignments or a possible corrupted NVM (IC7525 on diagram B11).
No menu, no OSD.	Probably a defective uP (ADOC).	
No Teletext.	IC7730 defective or not powered.	Check circuitry around IC7730 on diagram B13.
Strange switch 'off' behaviour	TS7445 possibly defective.	Check, with a multi-meter, whether transistor TS7445 is well functioning. (diagram A3).
Various symptoms, due to missing local supply voltage.	An interrupted fuse, NFR-resistor or connection.	When no symptom or error code leads you to a specific circuitry, use the supply lines overview (see supply lines overview), for a quick scan of all supply lines.

Software Downloading

In this chassis, you can **upgrade** the software via ComPair. You can find more information on how this procedure works in the ComPair file. It is possible that not all sets are equipped with the hardware, needed to make software upgrading possible. To speed up the programming process the firmware of the ComPair interface can be upgraded. See paragraph 'How To Order' for the order number

Philips Consumer Electronics

Technical Service Data

Service and Quality
Service Publications Dept.
One Philips Drive
P.O. Box 14810
Knoxville, TN 37914

Manual 7660
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First Publish: 04-21-2004
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Print Date: 3/10/2006

Scope Patterns

REFER TO SAFETY GUIDELINES

SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

CAUTION: USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING

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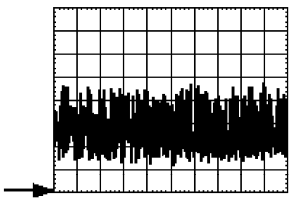
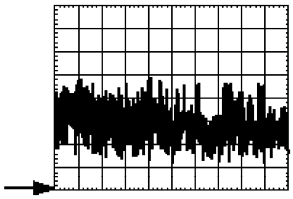
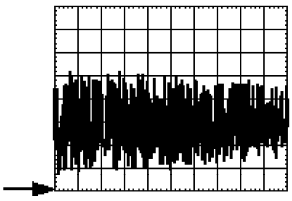


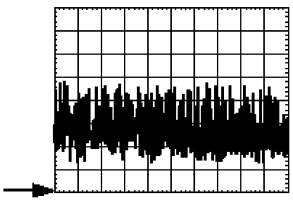
S1



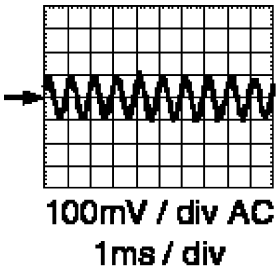
S2



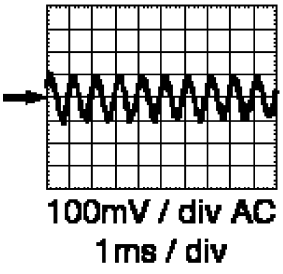
S3



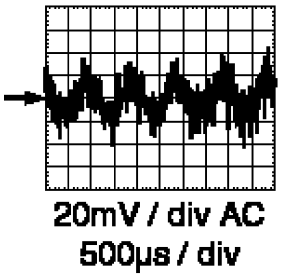
S4



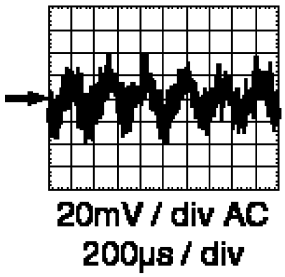
F480



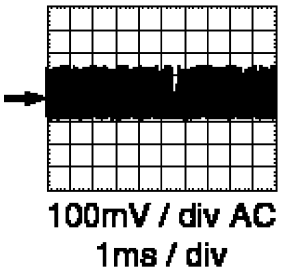
F481



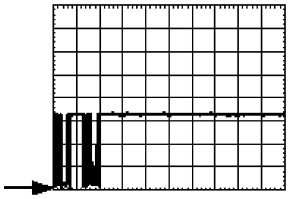
I436



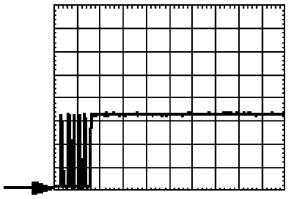
I437



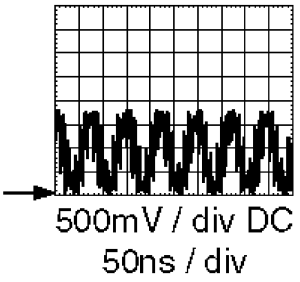
I438



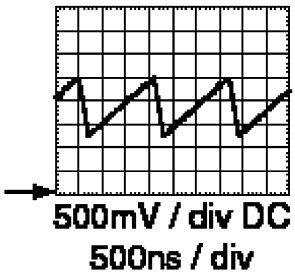
F508



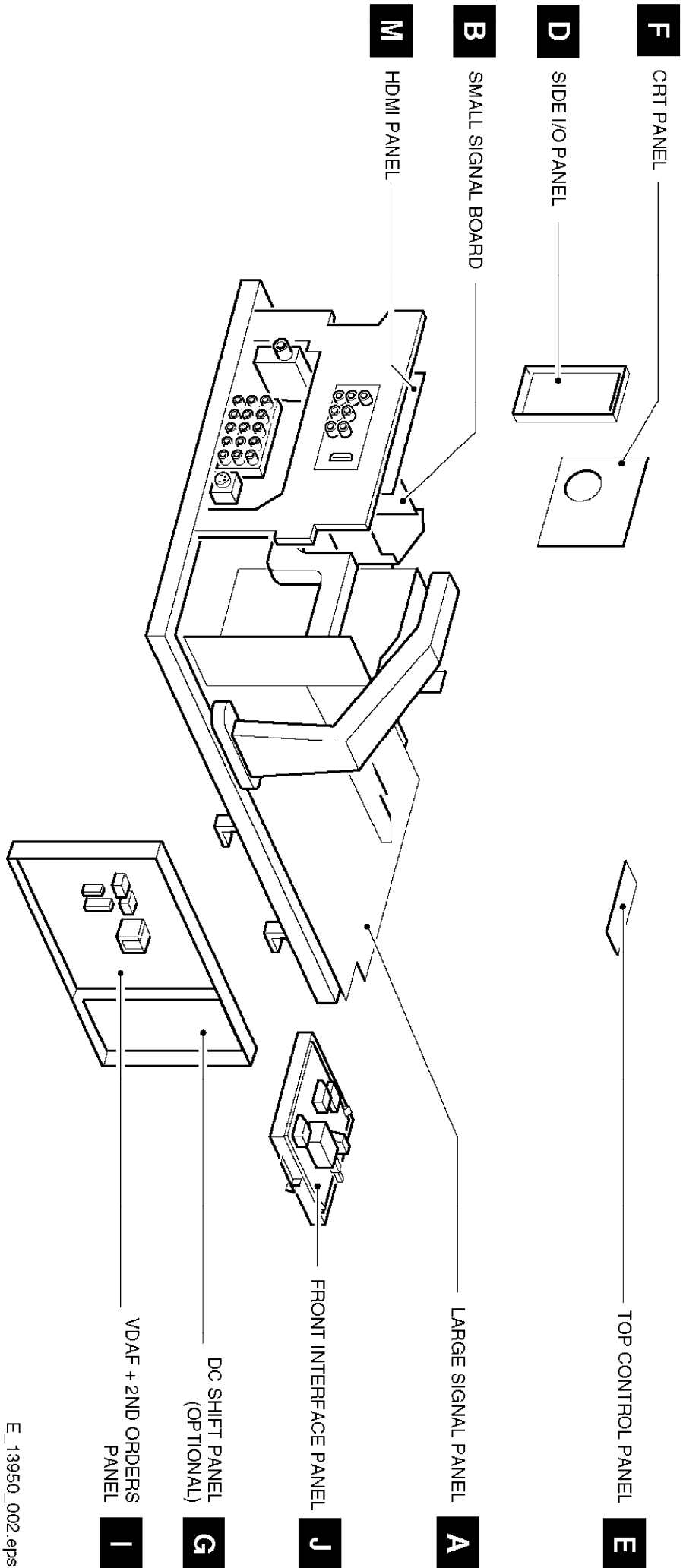
F509

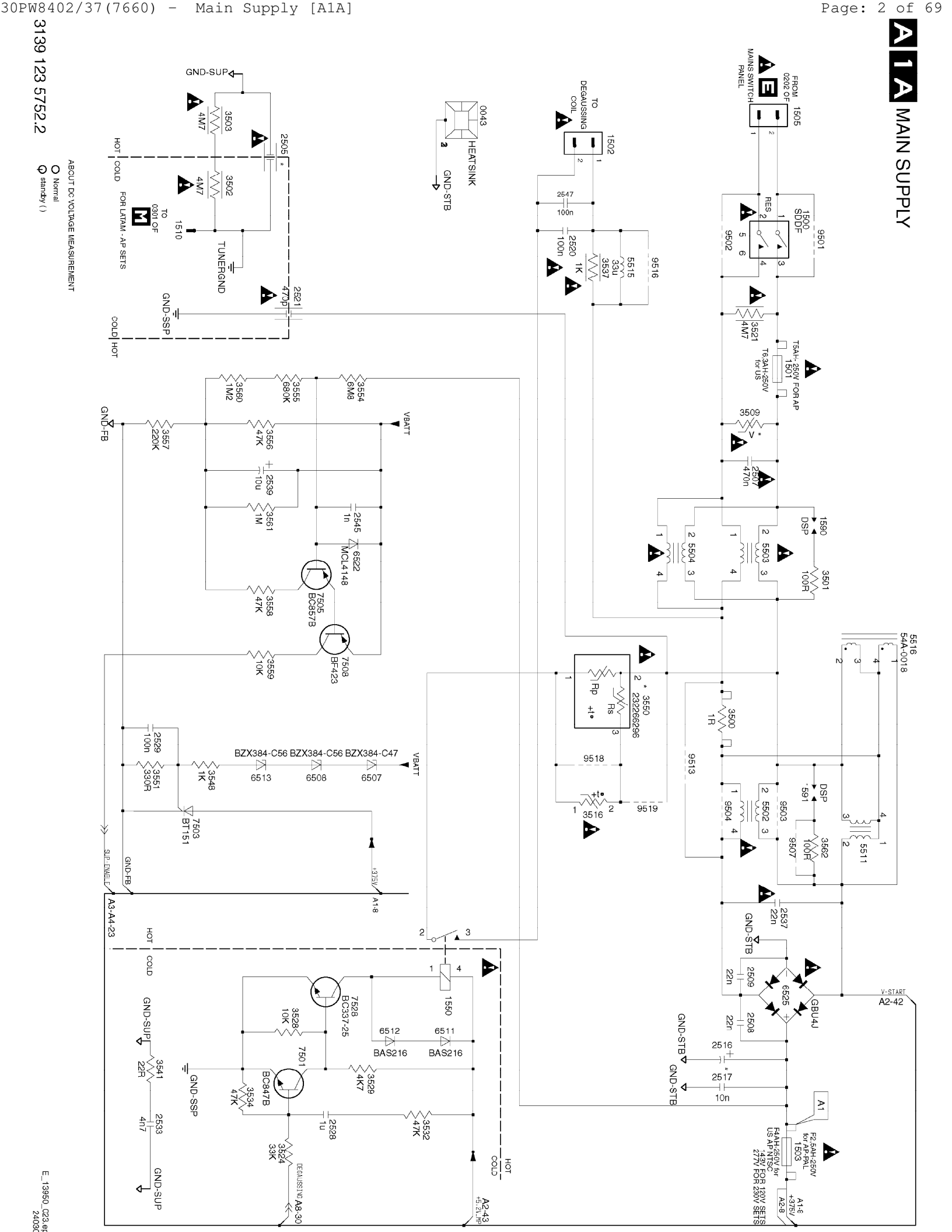


S5



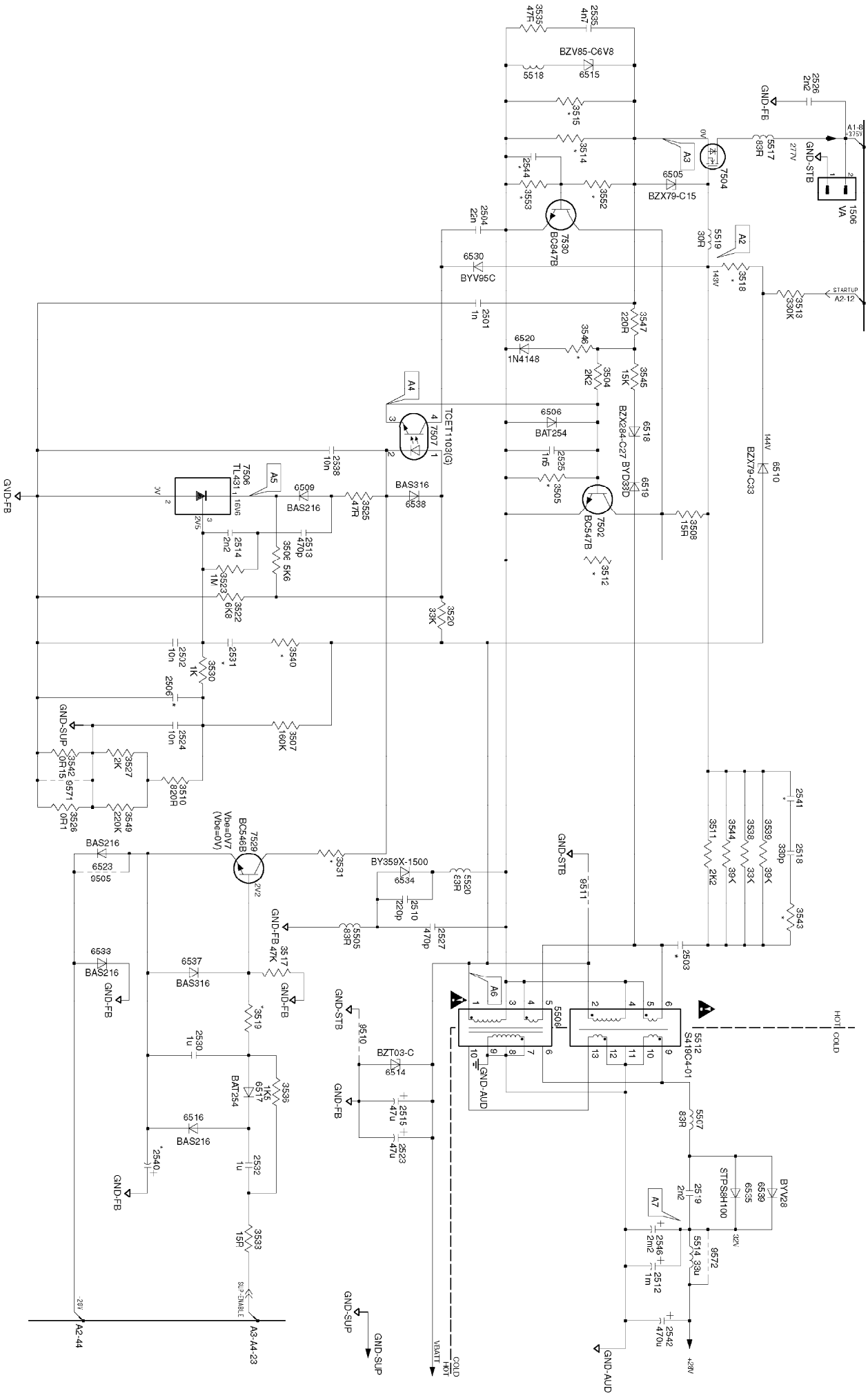
F652


F
CRT PANEL
D
SIDE I/O PANEL
B
SMALL SIGNAL BOARD
M
HDMI PANEL
E
TOP CONTROL PANEL
A
LARGE SIGNAL PANEL
J
FRONT INTERFACE PANEL
G
DC SHIFT PANEL (OPTIONAL)
I
VDAF + 2ND ORDERS PANEL
E_13950_002.eps
270204

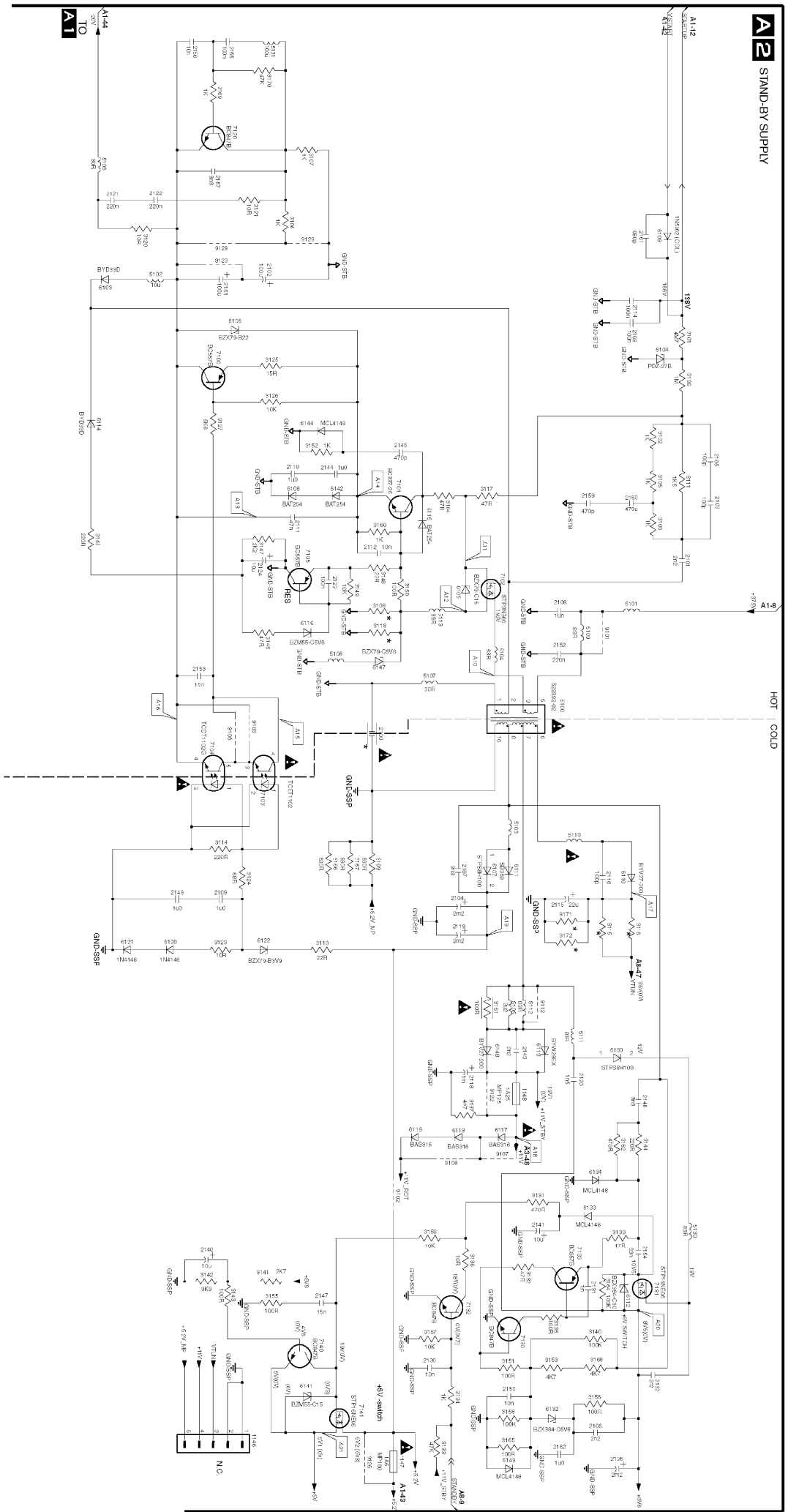

A1A MAIN SUPPLY
3139 123 5752.2
ABCUT DC VOLTAGE MEASUREMENT
Normal
standby ( )
MAINS SWITCH PANEL
FROM 0202 OF
TO DEGAUSSING COIL
HEATSINK
GND-STB
GND-SUP
GND-SSP
GND-FB
VBATT
TUNERGND
FOR LATAM - AP SETS
TO 0301 OF
HOT
COLD
DSP
SDDF
RES
T5AH-250V FOR AP
T6.3AH-250V for US
F2.5AH-250V for AP-PAL
F4AH-250V for US AP NTSC
115V FOR 120V SETS
277V FOR 230V SETS
BZX384-C56 BZX384-C56 BZX384-C47
MCL4148
BC857B
BF-423
BT151
BC337-25
BC847B
BAS216
GBU4J
DEGAUSSING
V-START
A2-42
A1-8
A3-A4-23
A2-43
A8-30
E_13950_023.eps
2403C

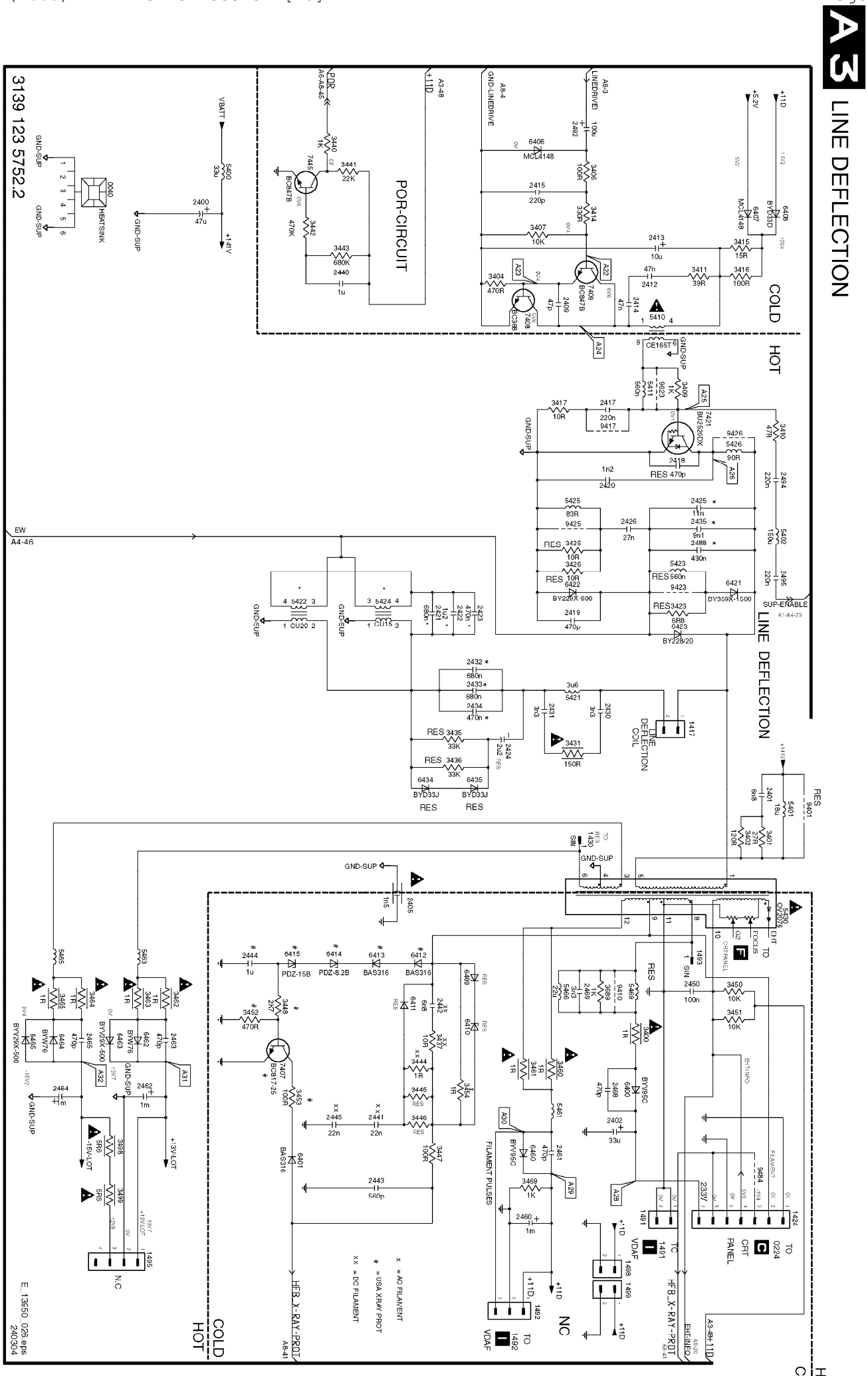
3139 123 5752.2

A1B MAIN SUPPLY



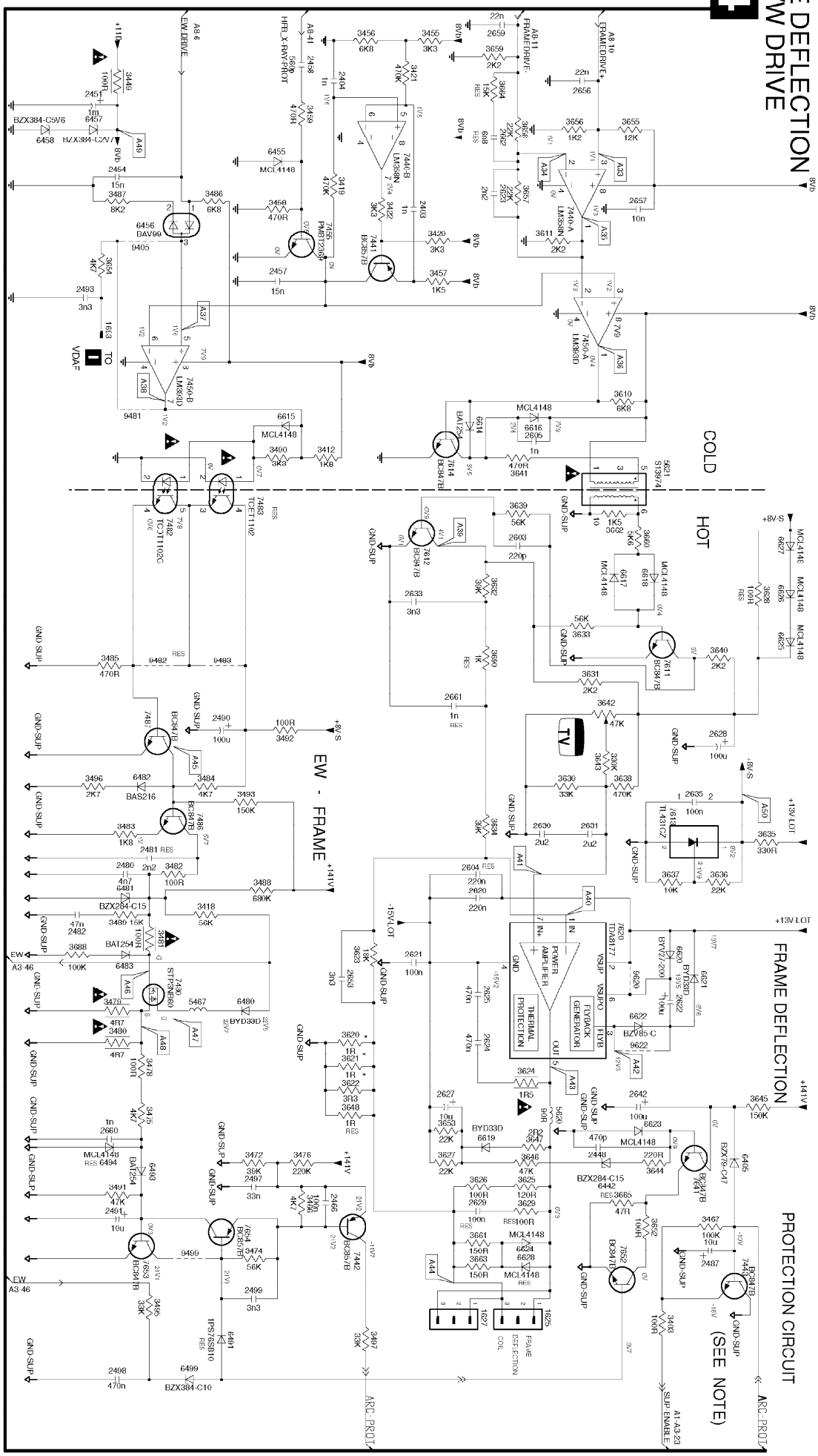
3139 123 5752.2




A3 LINE DEFLECTION
3139 123 5752.2
POR-CIRCUIT
COLD
HOT
LINE DEFLECTION
SUP-ENABLE
FILAMENT PULSES
VDAF
CRT PANEL
HFB_X-RAY-PROT
N.C
GND-SUP
+11D
+5.2V
+141V
+13V-LOT
-15V-LOT
VBATT
EW
A4-46
HEATSINK
BC847B
BC368
BC817-25
BU2520DX
BY228/20
BY359X-1500
BY329X-500
BYW76
BY199C
BYD33J
BAS316
PDZ-15B
PDZ-8.2B
MCL4148
BY228X-600
LINE DEFLECTION COIL
FOCUS
SIN
TO 0224
E_13650_026.eps 240304

FRAME DEFLECTION E/W DRIVE

A4

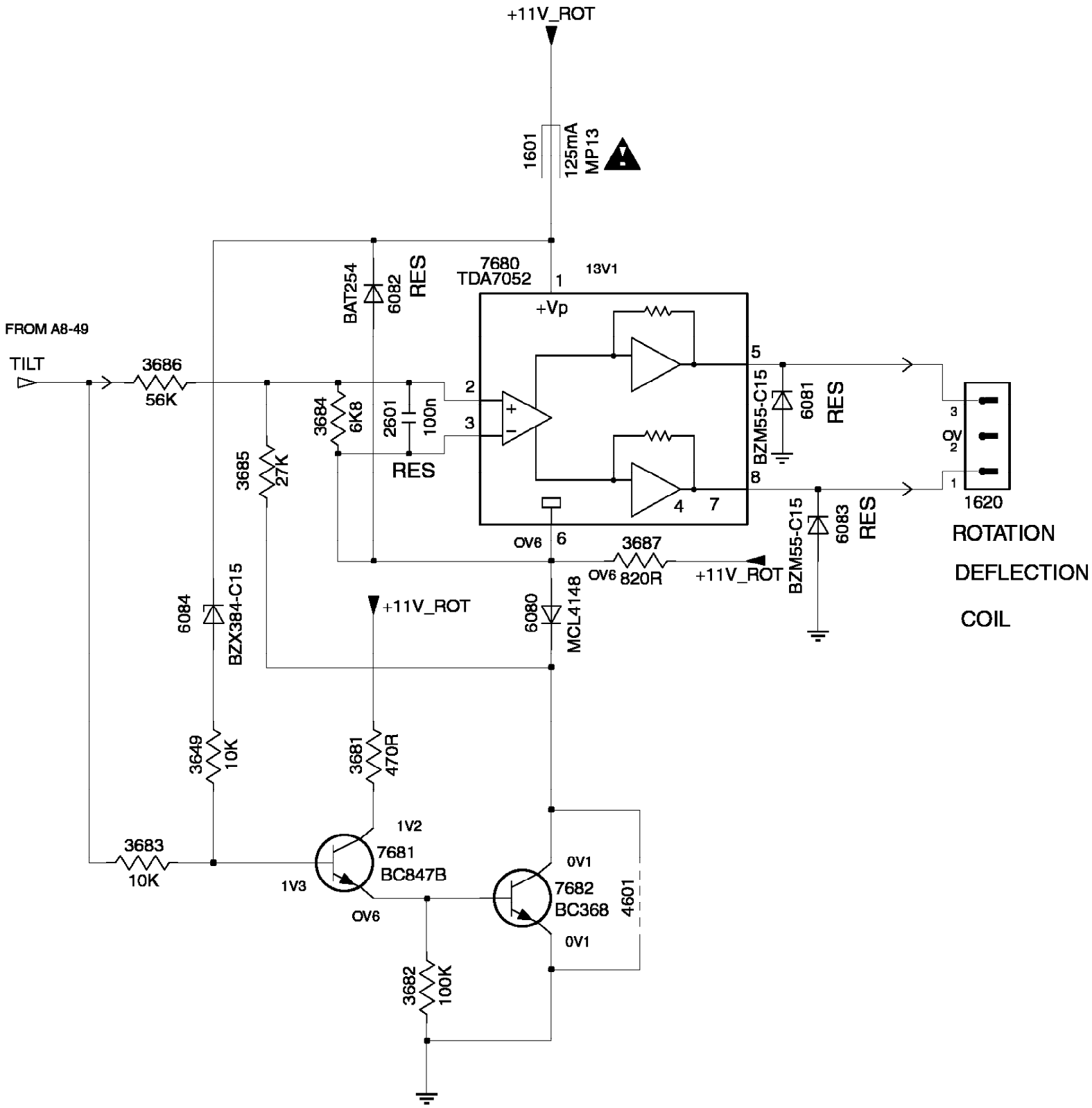


NOTE

3139 123 5752.2

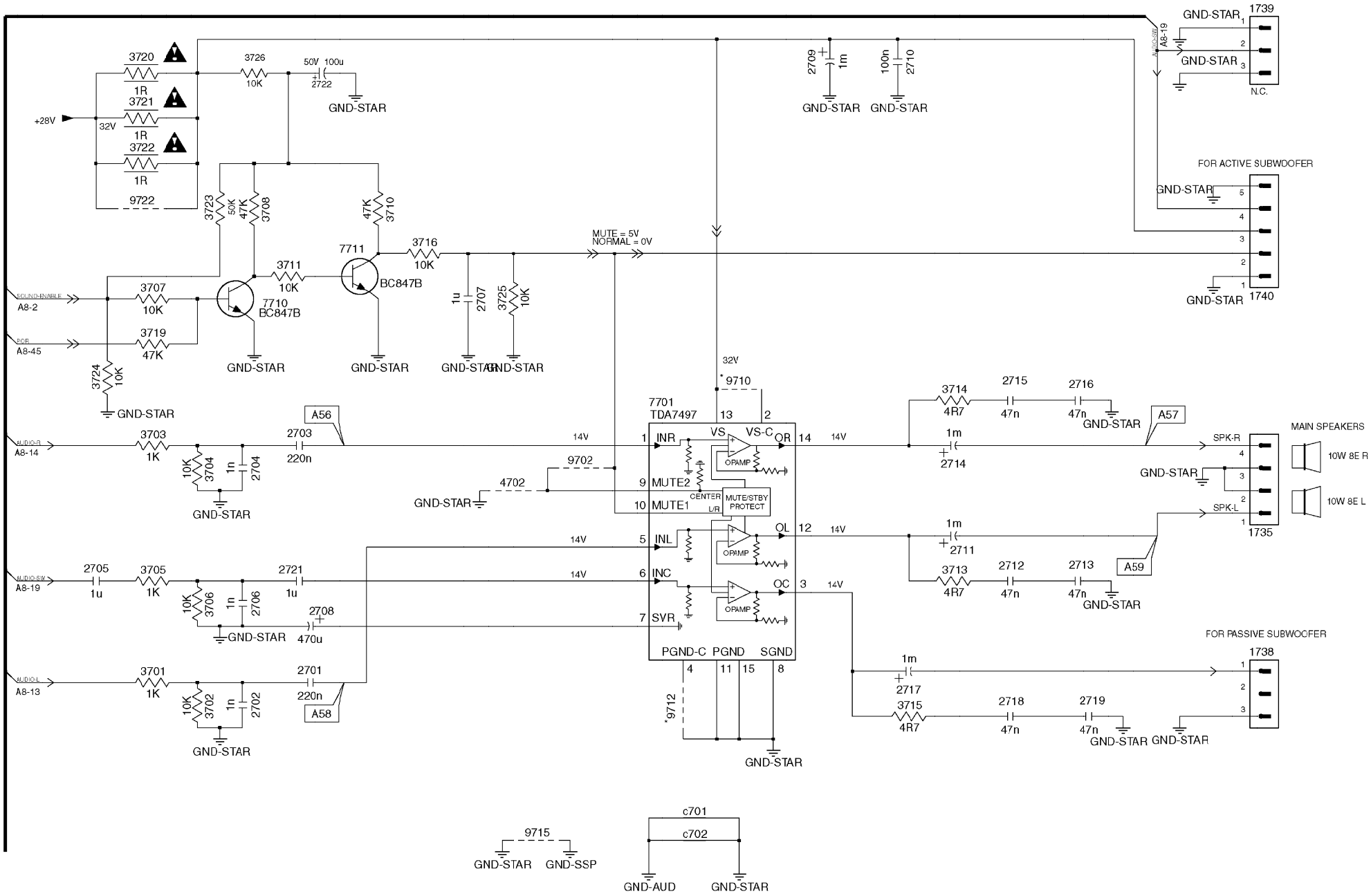
E_13650_027.e
24Oct

A5 ROTATION CIRCUITRY



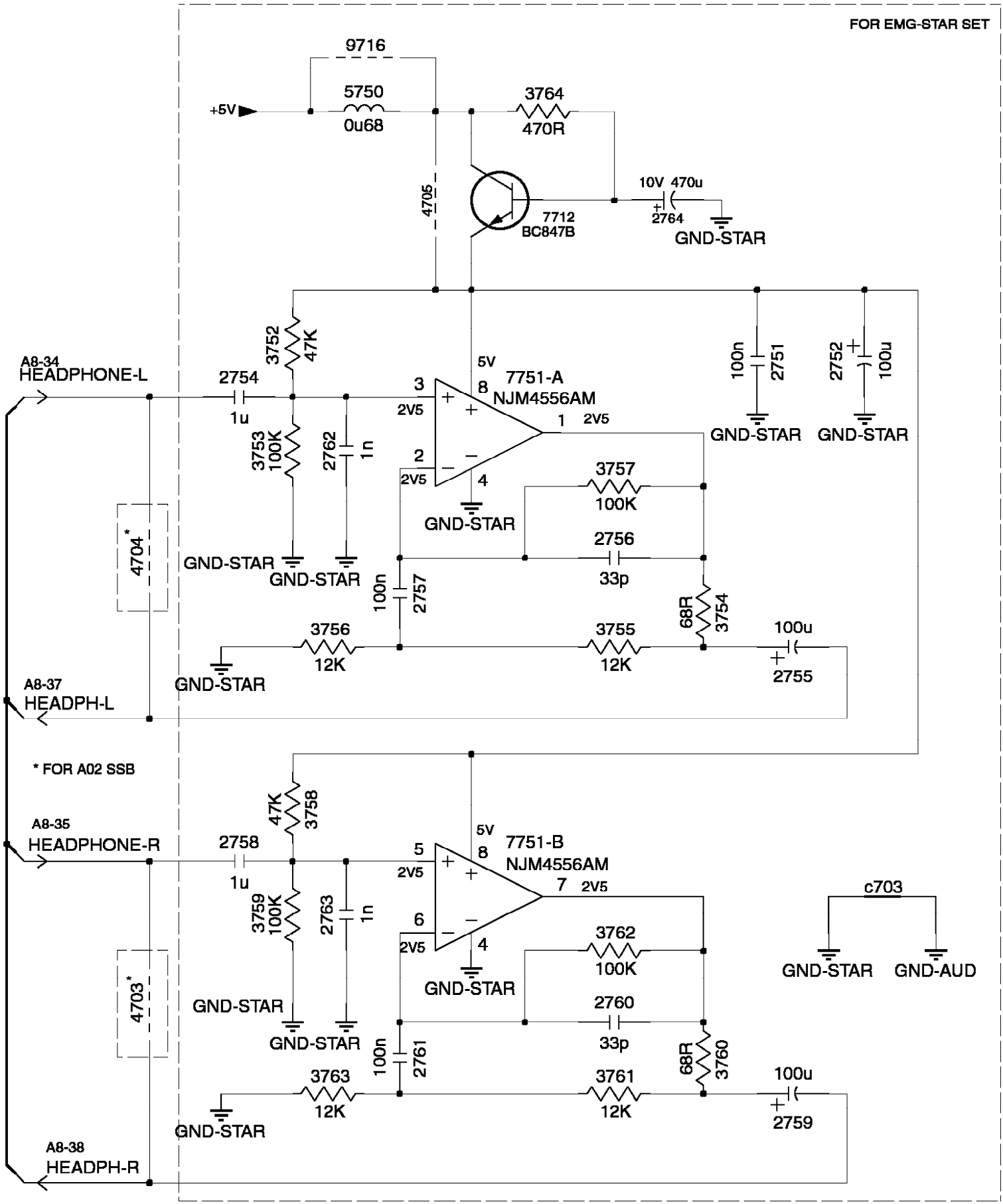
E_13950_028.eps
120304

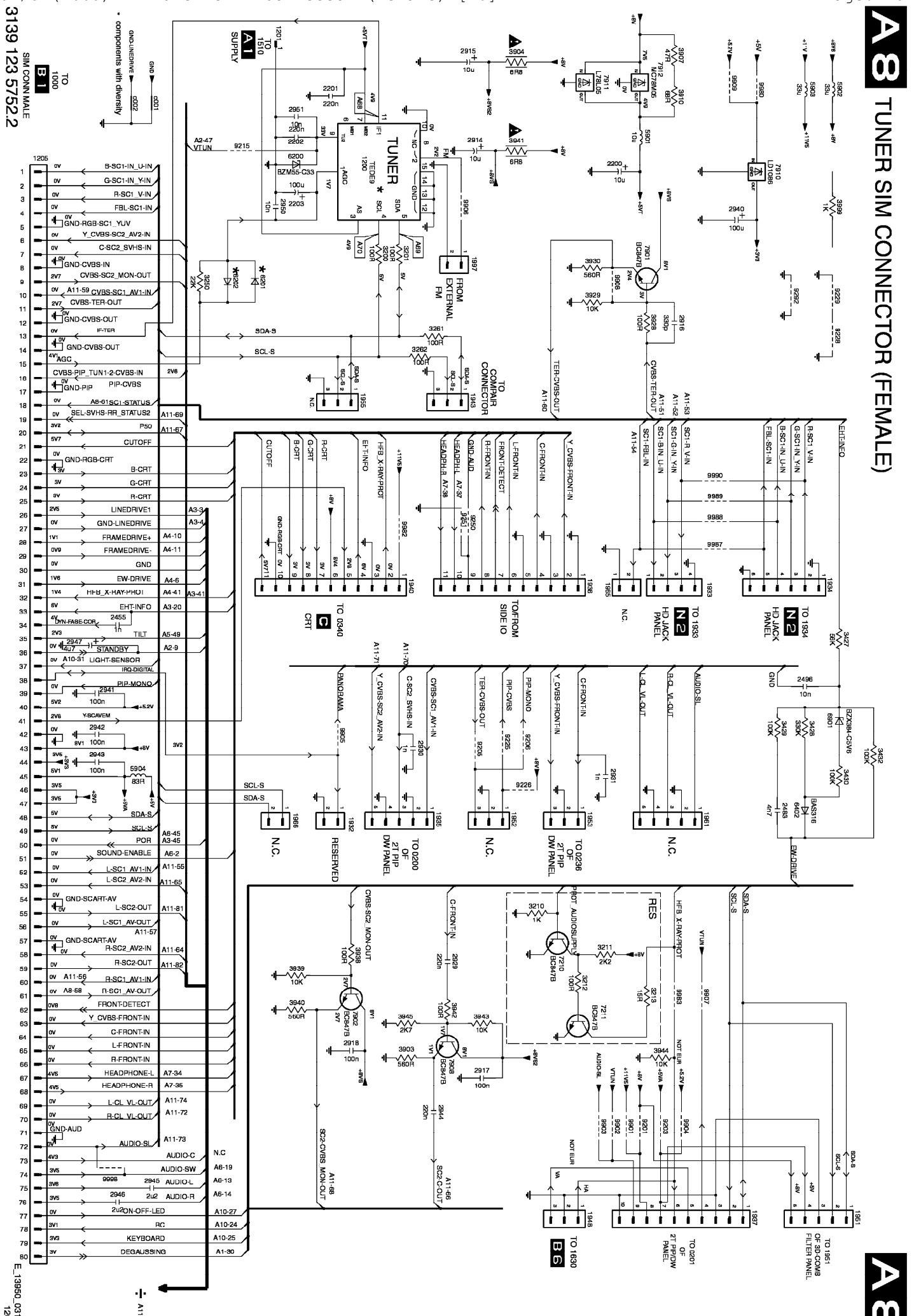
A6 AUDIO AMPLIFIER



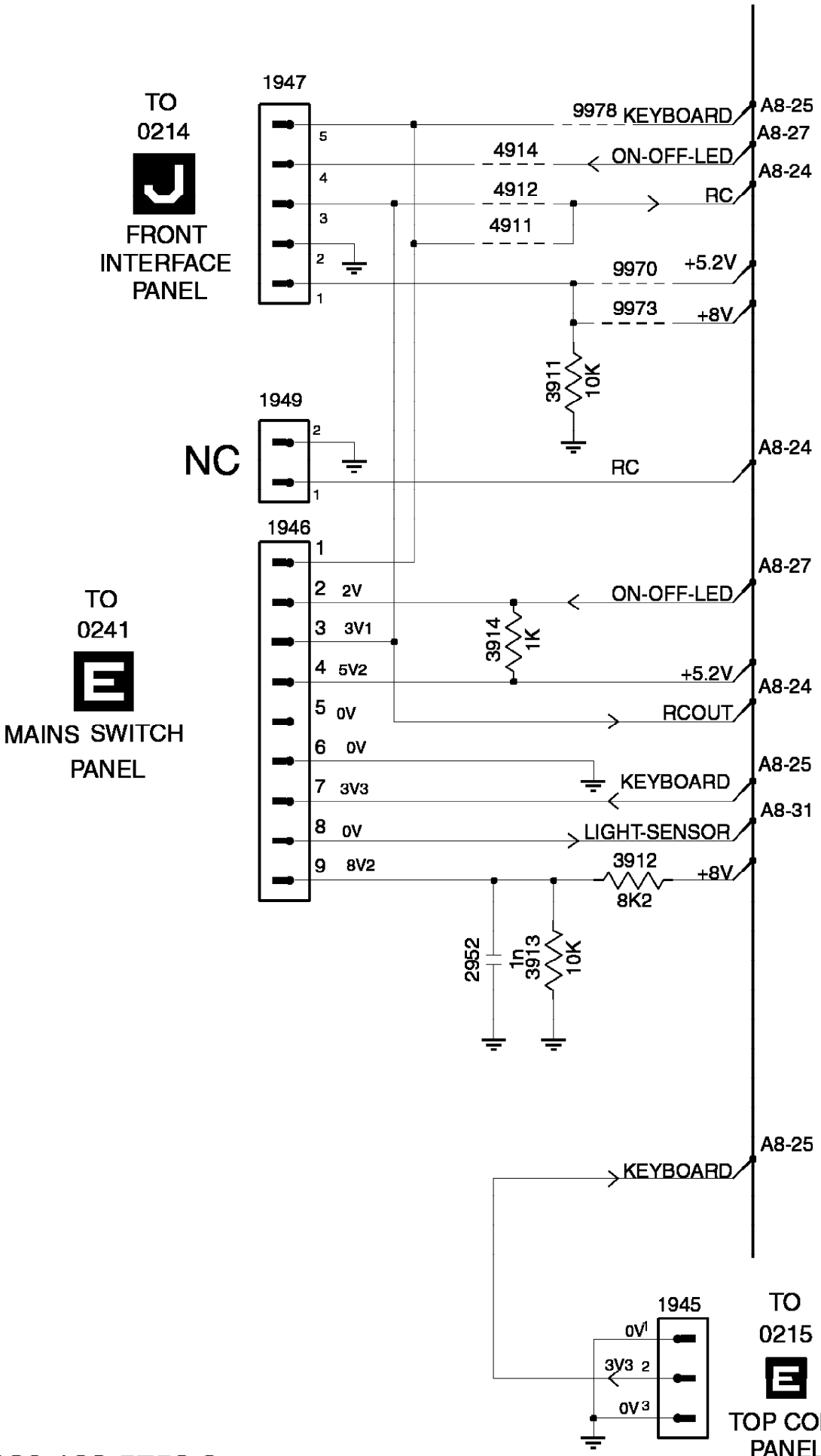
* ONLY FOR SUBWCOFER

A7 HEADPHONE AMPLIFIER



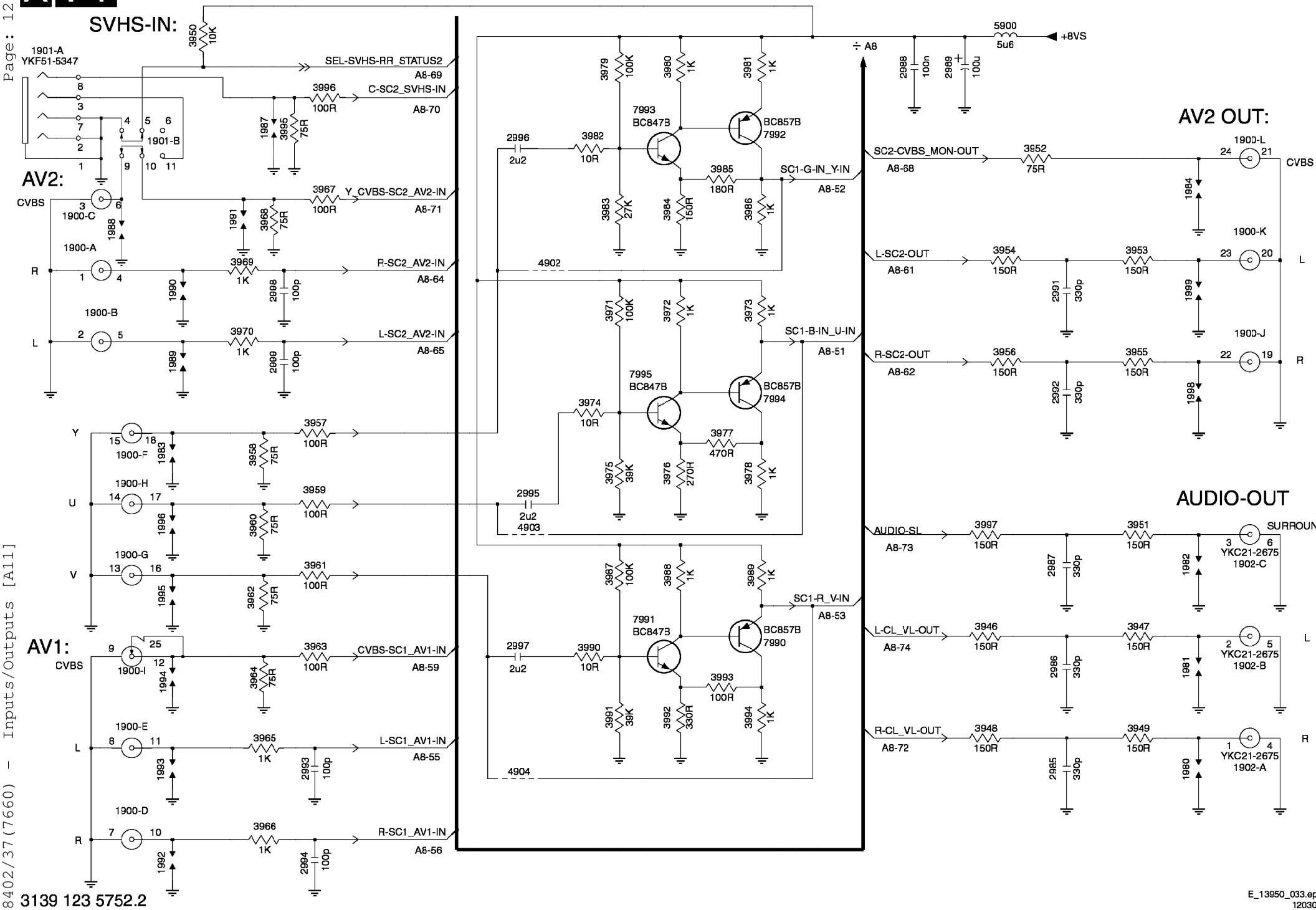

A8
TUNER SIM CONNECTOR (FEMALE)
3139 123 5752.2
SIM CONN MALE
B1
TO 1000
* components with diversity
A1 SUPPLY
TO 1510
TUNER
TEDE9 1200
FROM EXTERNAL FM
TO COMPAIR CONNECTOR
TER-CVBS-OUT
CVBS-TER-OUT
SDA-S
SCL-S
B-SC1-IN_U-IN
G-SC1-IN_Y-IN
R-SC1_V-IN
FBL-SC1-IN
GND-RGB-SC1_YUV
Y_CVBS-SC2_AV2-IN
C-SC2_SVHS-IN
GND-CVBS-IN
CVBS-SC2_MON-OUT
A11-59 CVBS-SC1_AV1-IN
CVBS-TER-OUT
GND-CVBS-OUT
IF-TER
GND-CVBS-OUT
AGC
CVBS-PIP_TUN1-2-CVBS-IN
GND-PIP
PIP-CVBS
A8-61 SC1-STATUS
SEL-SVHS-RR_STATUS2
P50
CUTOFF
GND-RGB-CRT
B-CRT
G-CRT
R-CRT
LINEDRIVE1
GND-LINEDRIVE
FRAMEDRIVE+
FRAMEDRIVE-
GND
EW-DRIVE
HFB_X-RAY-PROT
EHT-INFO
DYN-FASE-COR
TILT
STANDBY
LIGHT-SENSOR
IRQ-DIGITAL
PIP-MONO
Y-SCAVEM
SDA-S
SCL-S
POR
SOUND-ENABLE
L-SC1_AV1-IN
L-SC2_AV2-IN
GND-SCART-AV
L-SC2-OUT
L-SC1_AV-OUT
GND-SCART-AV
R-SC2_AV2-IN
R-SC2-OUT
R-SC1_AV1-IN
R-SC1_AV-OUT
FRONT-DETECT
Y_CVBS-FRONT-IN
C-FRONT-IN
L-FRONT-IN
R-FRONT-IN
HEADPHONE-L
HEADPHONE-R
L-CL_VL-OUT
R-CL_VL-OUT
GND-AUD
AUDIO-SL
AUDIO-C
AUDIO-SW
AUDIO-L
AUDIO-R
ON-OFF-LED
RC
KEYBOARD
DEGAUSSING
TO 0340 CRT
TO/FROM SIDE IO
N.C.
TO 1933 HD JACK PANEL
TO 1934 HD JACK PANEL
RESERVED
TO 0200 OF 2T PIP DW PANEL
TO 0236 OF 2T PIP DW PANEL
TO 1630
TO 0201 OF 2T PIP/DW PANEL
TO 1951 OF 3D-COMB FILTER PANEL
A8

A10 FRONT



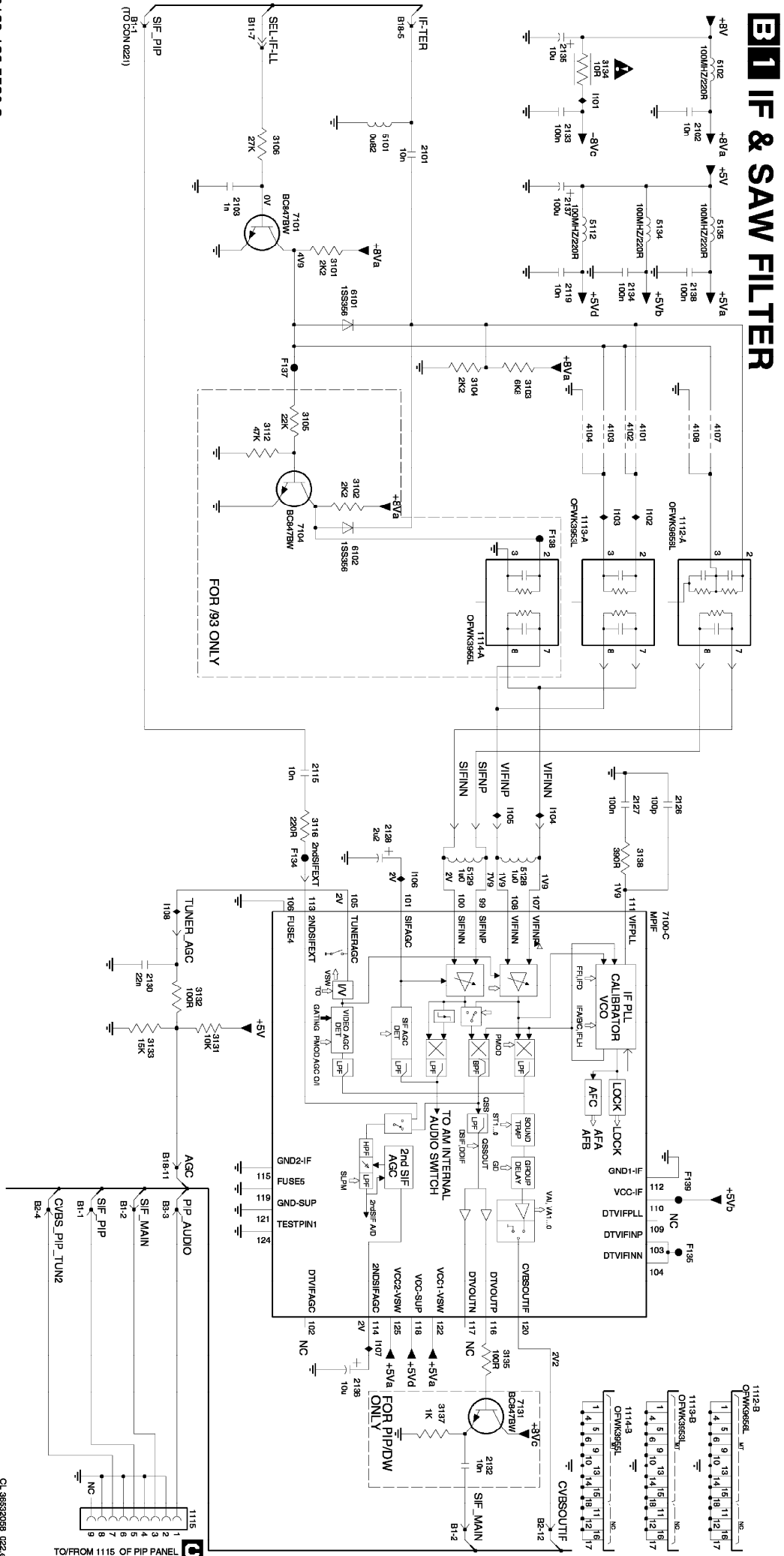
E_13950_032.eps

A11 INPUTS/OUTPUTS

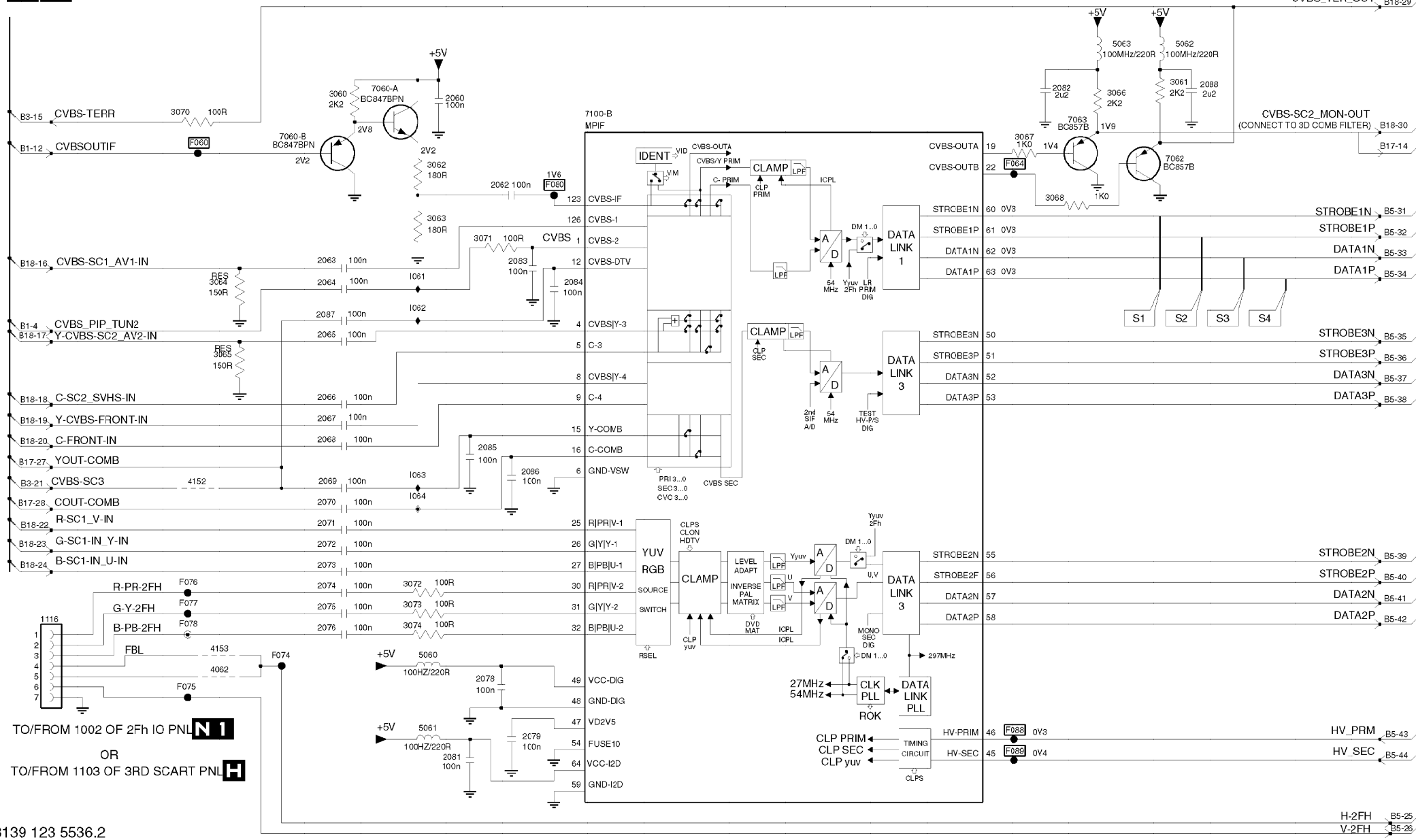


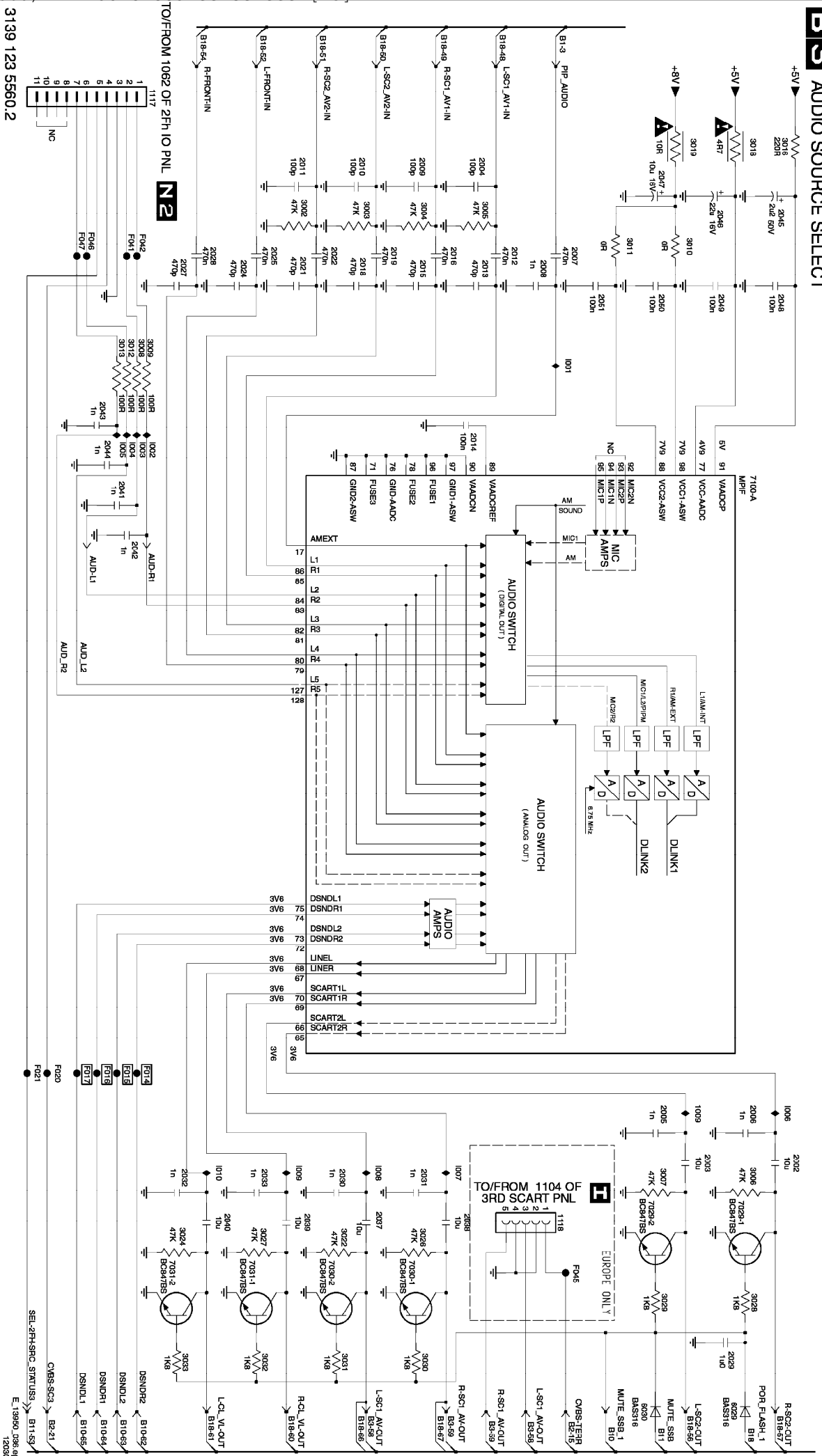
3139 123 5752.2

E_13950_033.ep
12030

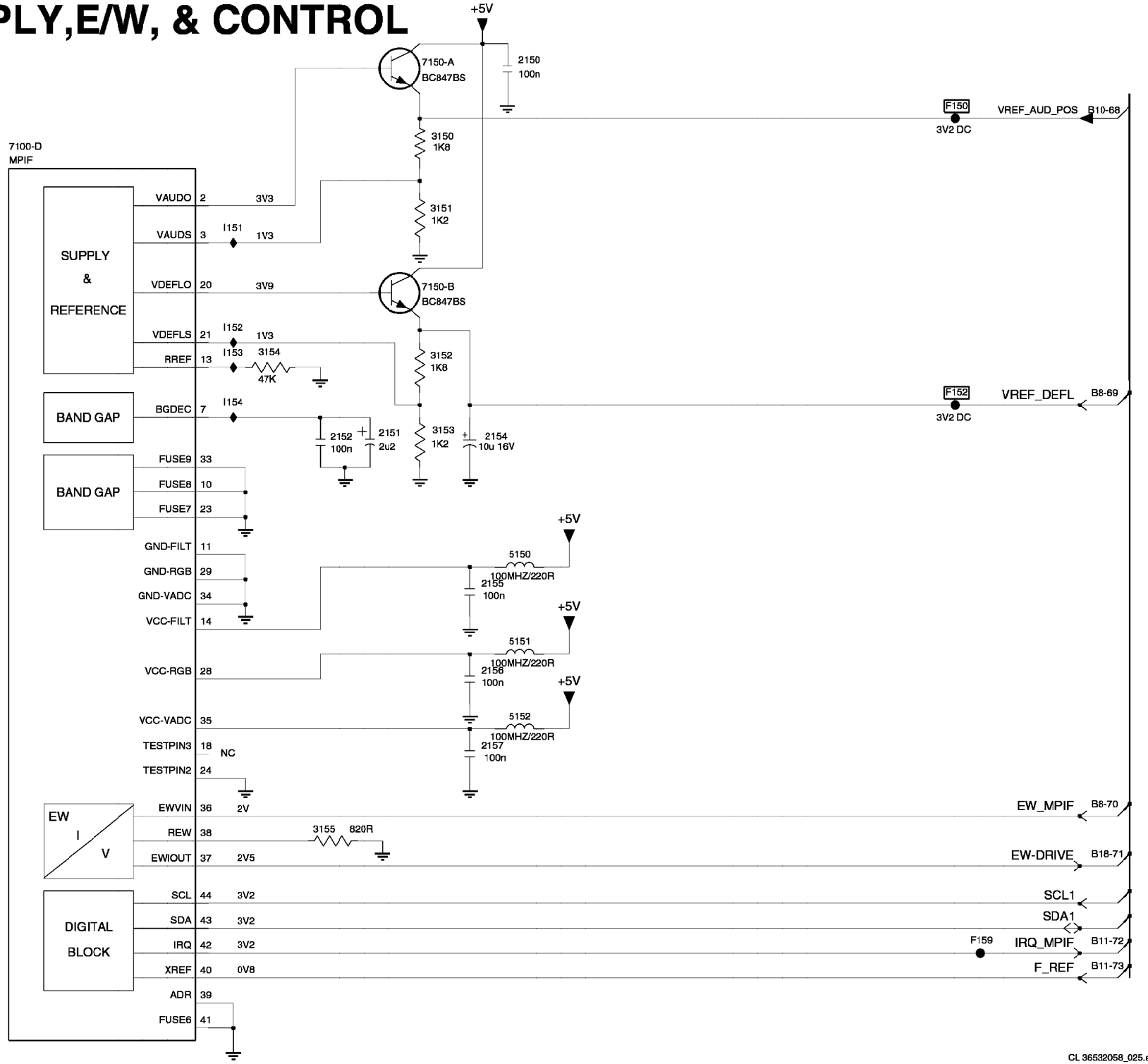

B1 IF & SAW FILTER
3139 123 5536.2
FOR /93 ONLY
FOR PIP/DW ONLY
TO/FROM 1115 OF PIP PANEL
TO AM INTERNAL AUDIO SWITCH
IF PLL CALIBRATOR VCO
SIF_PIP
SEL-IF-LL
IF-TER
+8V
+8Va
-8Vc
+5V
+5Va
+5Vb
+5Vd
+5Vo
BC847BW
BC847BW
BC847BW
OFWK3965L
OFWK3955L
OFWK9665L
7100-C
MPIF
VIFPLL
VIFINN
VIFINP
SIFINN
SIFINP
SIFAGC
TUNERAGC
2NDSIFEXT
FUSE4
TUNER_AGC
AGC
GND2-IF
FUSE5
GND-SUP
TESTPIN1
GND1-IF
VCC-IF
DTVIFPLL
DTVIFINP
DTVIFINN
DTVIFAGC
2NDSIFAGC
VCC-SUP
DTVOUTP
DTVOUTN
CVBSOUTIF
AFC
LOCK
AFA
AFB
SIF AGC DET
VIDEO AGC DET
2nd SIF AGC
SOUND TRAP
GROUP DELAY
P/P_AUDIO
SIF_MAIN
SIF_PIP
CVBS_PIP_TUN2
CVBSOUTIF
NC

B2 VIDEO SOURCE SELECTION AND DATA LINK




B3
AUDIO SOURCE SELECT
3139 123 5560.2
TO/FROM 1062 OF 2Fh IO PNL
N2
TO/FROM 1104 OF 3RD SCART PNL
H
EUROPE ONLY
7100-A MPIF
AUDIO SWITCH (DIGITAL OUT)
AUDIO SWITCH (ANALOG OUT)
MIC AMPS
AUDIO AMPS
DLINK1
DLINK2
LPF
A/D
8.75 MHz
AMEXT
DSNDL1
DSNDR1
DSNDL2
DSNDR2
LINEL
LINER
SCART1L
SCART1R
SCART2L
SCART2R
R-FRONT-IN
L-FRONT-IN
R-SC2_AV2-IN
L-SC2_AV2-IN
R-SC1_AV1-IN
L-SC1_AV1-IN
PIP_AUDIO
AUD-L1
AUD-R1
AUD_L2
AUD_R2
SEL-2FH-SRC_STATUS3
CVBS-SC3
R-SC1_AV-OUT
L-SC1_AV-OUT
CVBS-TER
MUTE_SSB
POR_FLASH_1
L-SC2-OUT
R-SC2-OUT
L-CL_VL-OUT
R-CL_VL-OUT
L-SC1_AV-OUT
+5V
+8V
NC

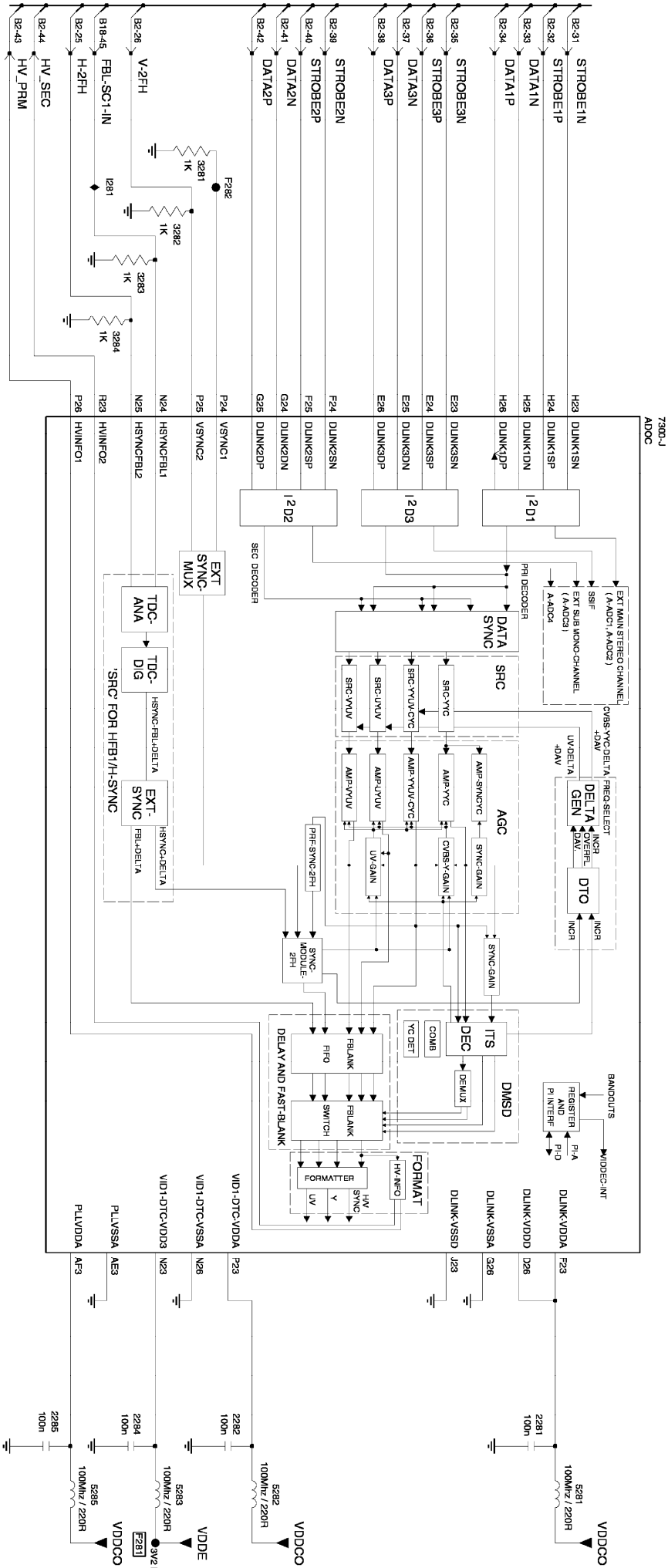
B4 MPIF-SUPPLY,E/W, & CONTROL



CL 36532058_025.e
2111

30PW8402/37(7660) - Audio Source Select [B4]

B5 VIDEO DECODER

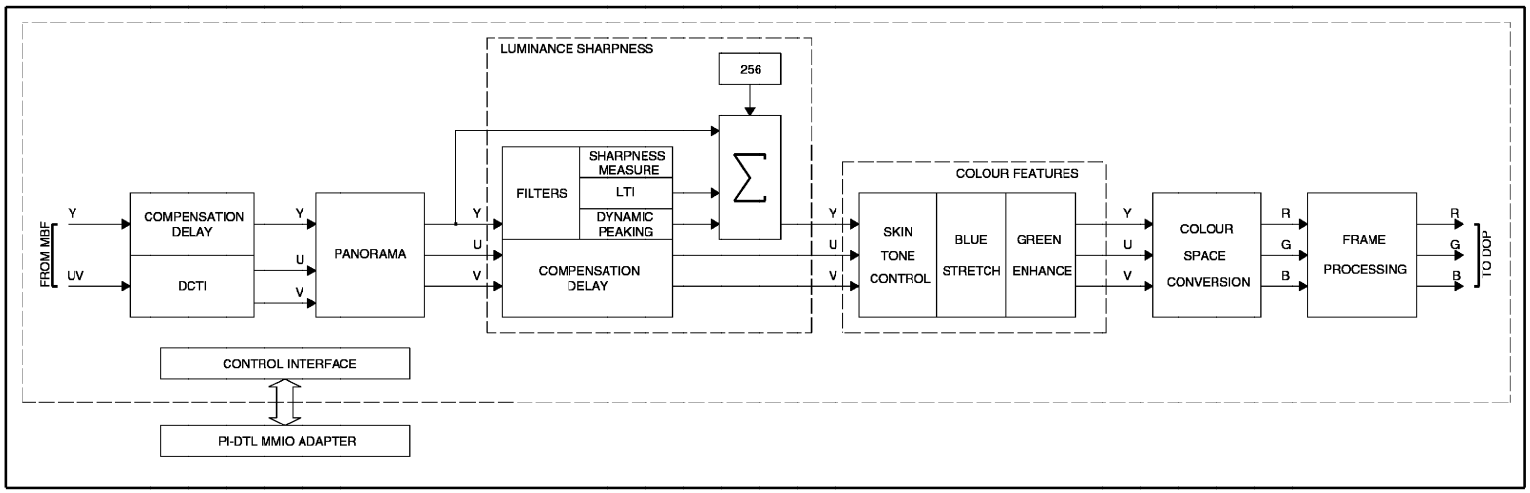


3139 123 5536.2

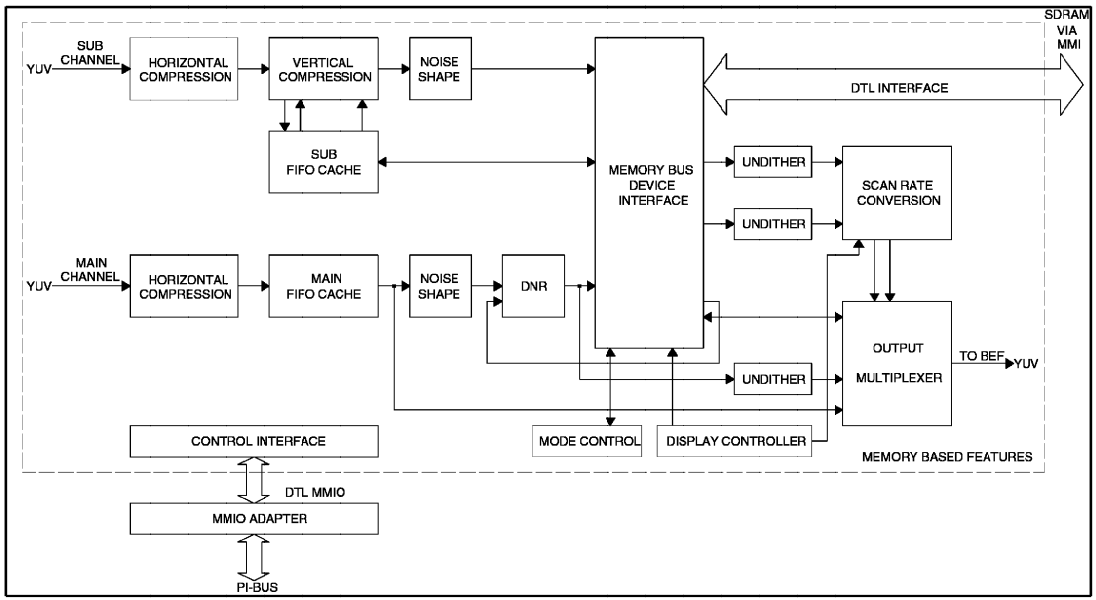
CL 36532058_026.e
2111

B6 FEATURE BOX

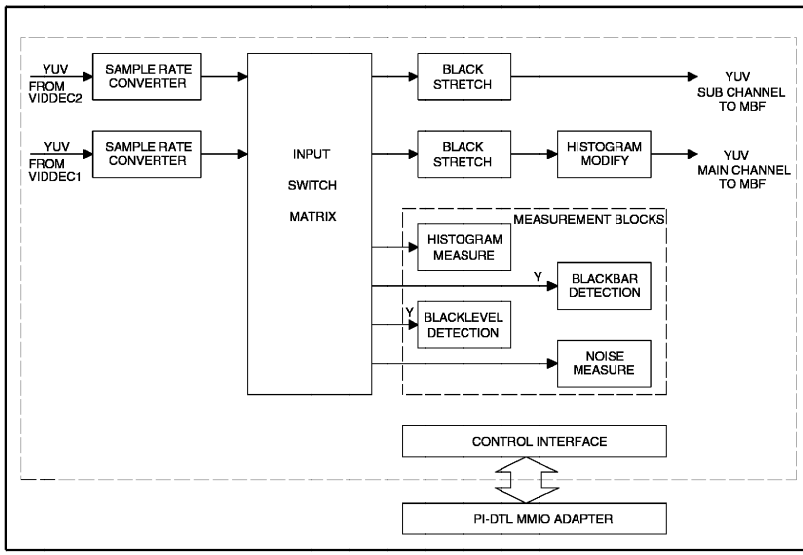
7300
BACK END PROCESSING



7300
MEMORY BASED PROCESSING

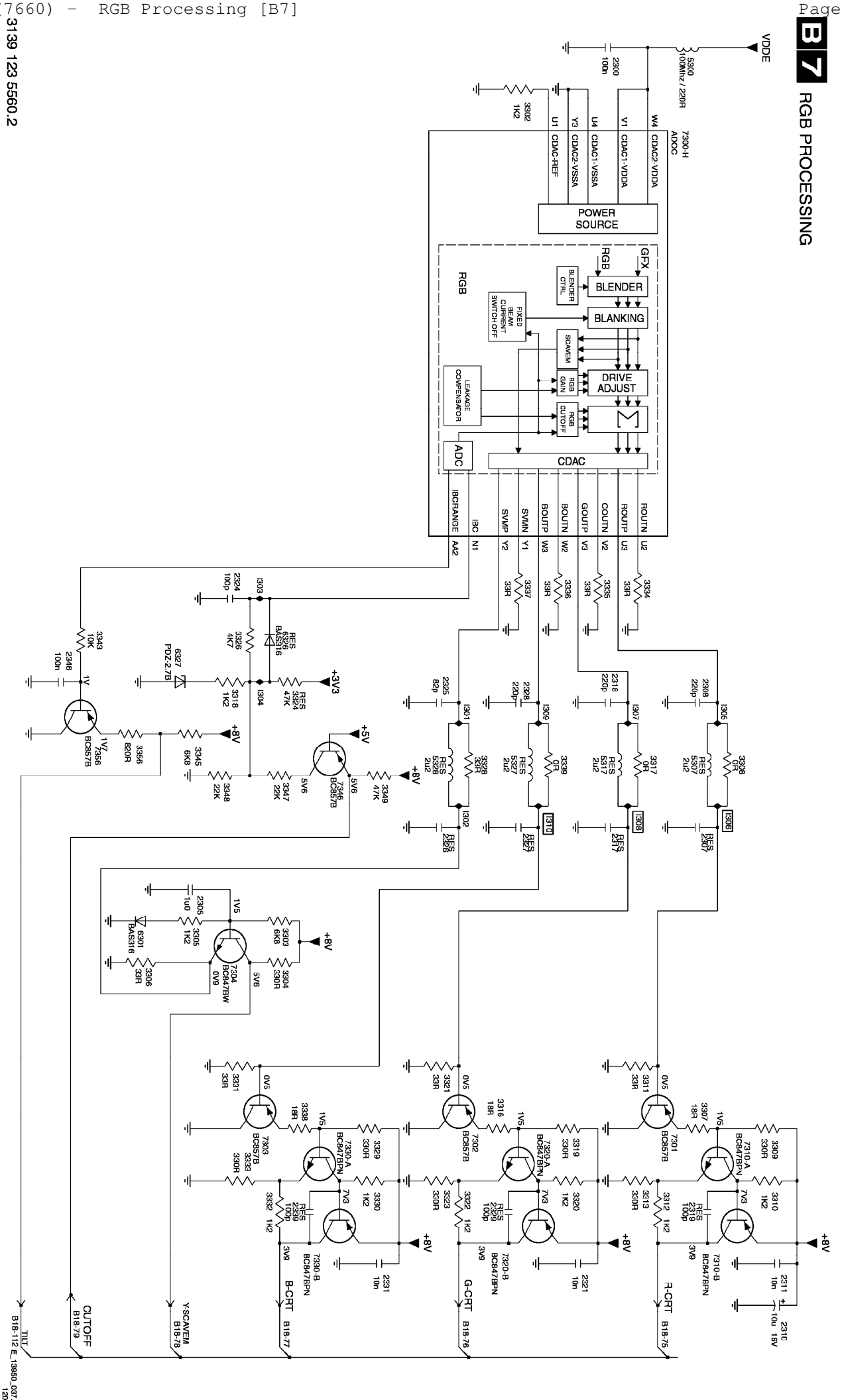


7300
FRONT END PROCESSING

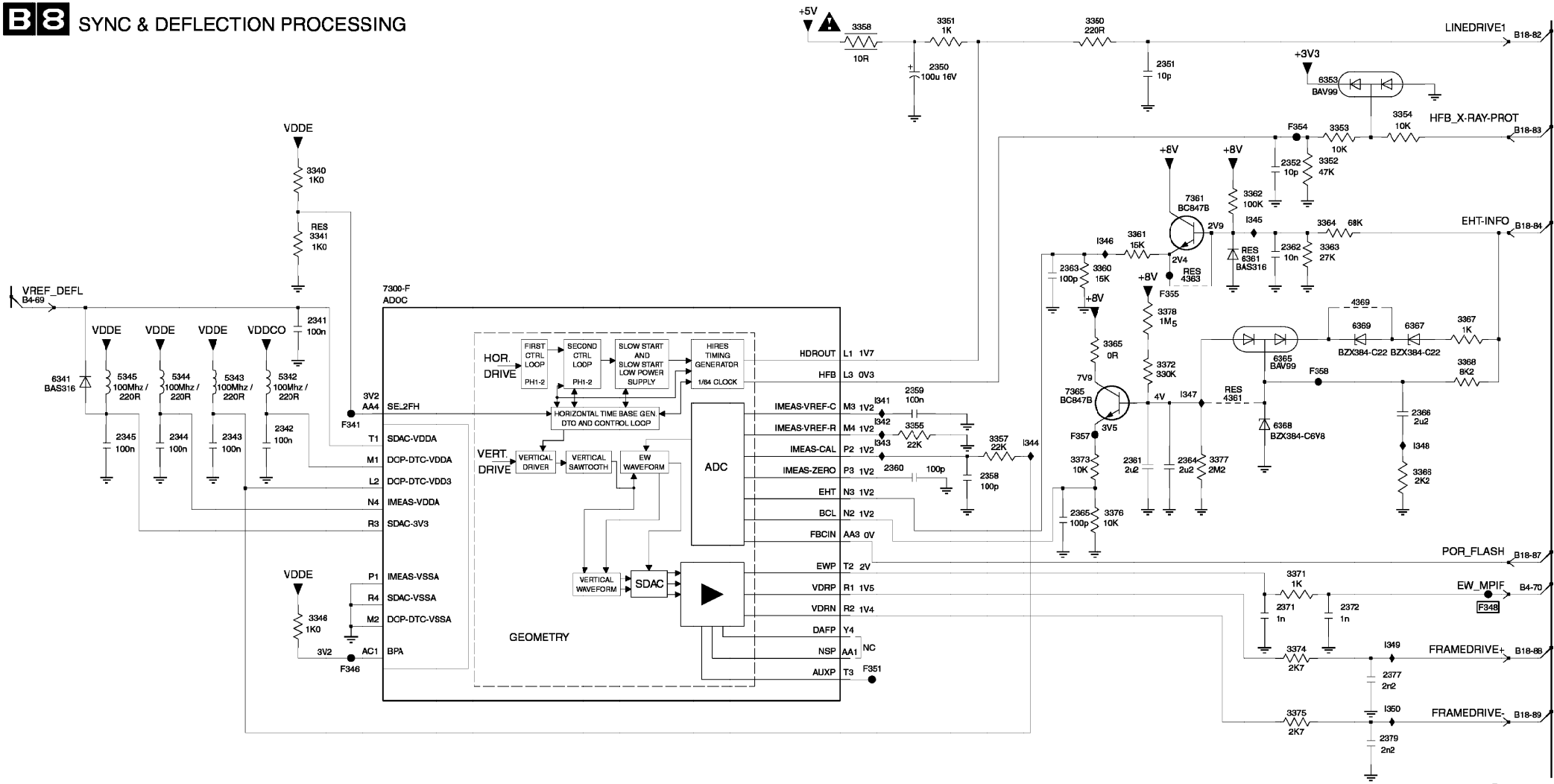


CL 36532058_027.e
0209

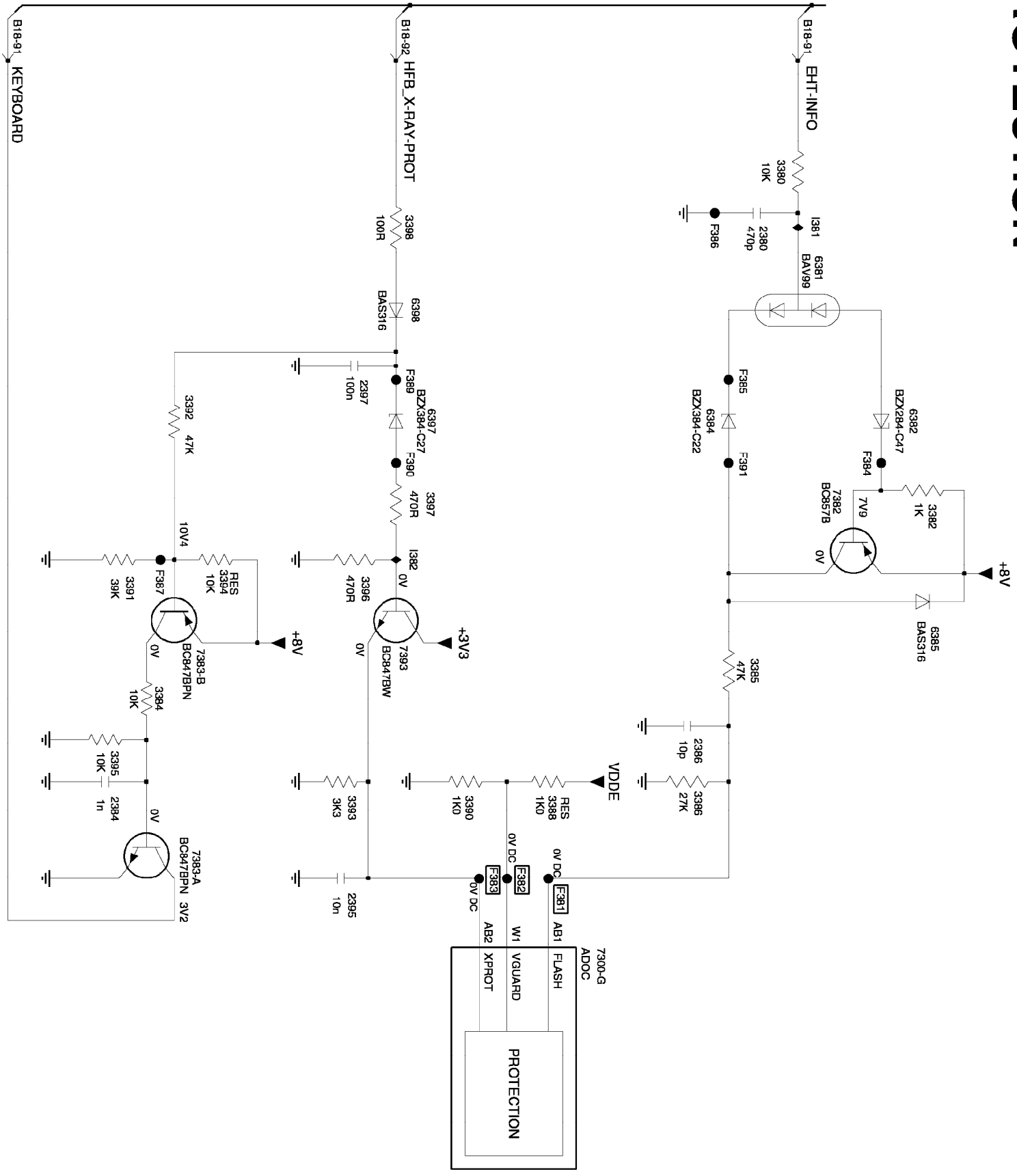
B7 RGB PROCESSING

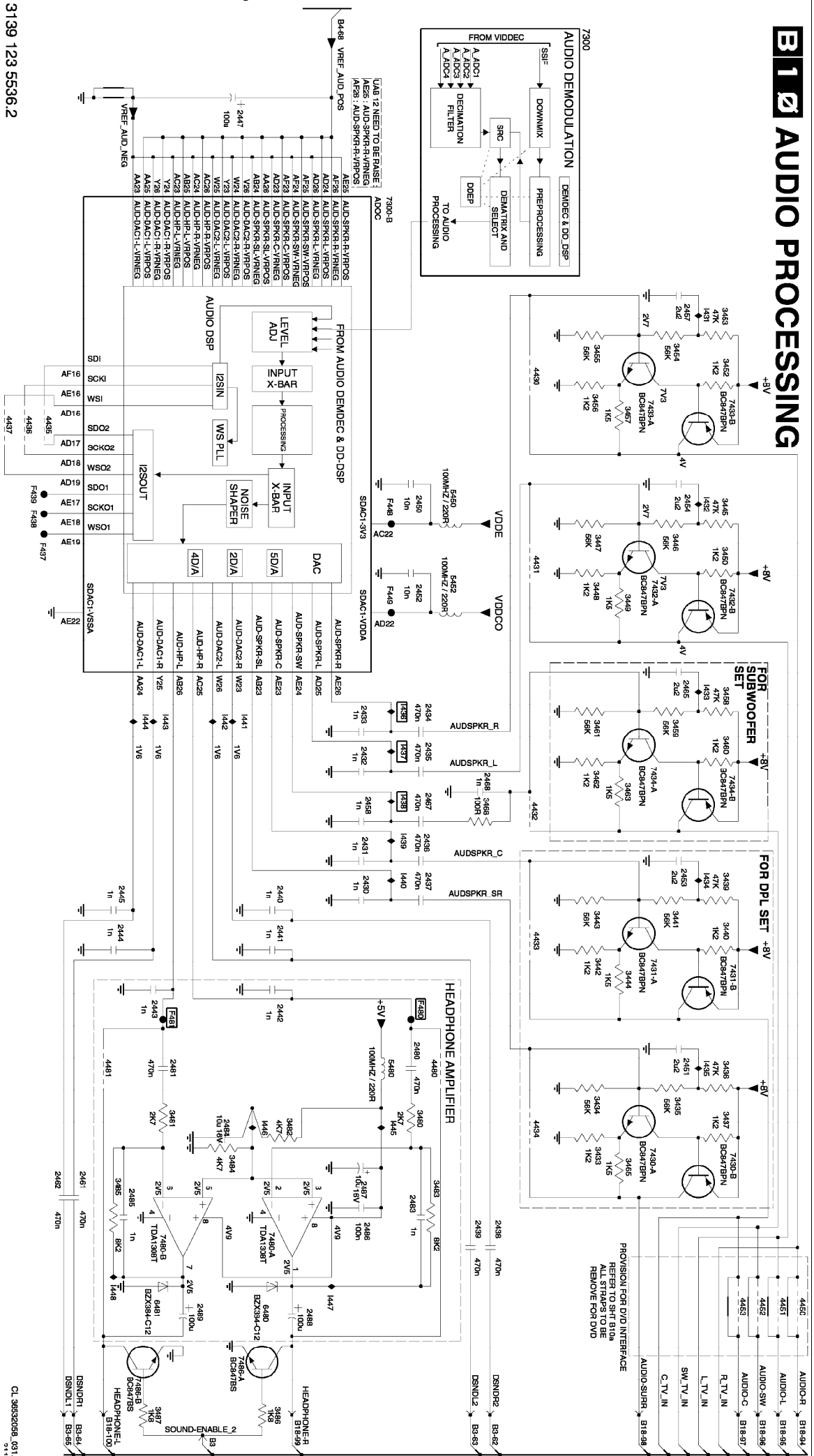


B8 SYNC & DEFLECTION PROCESSING



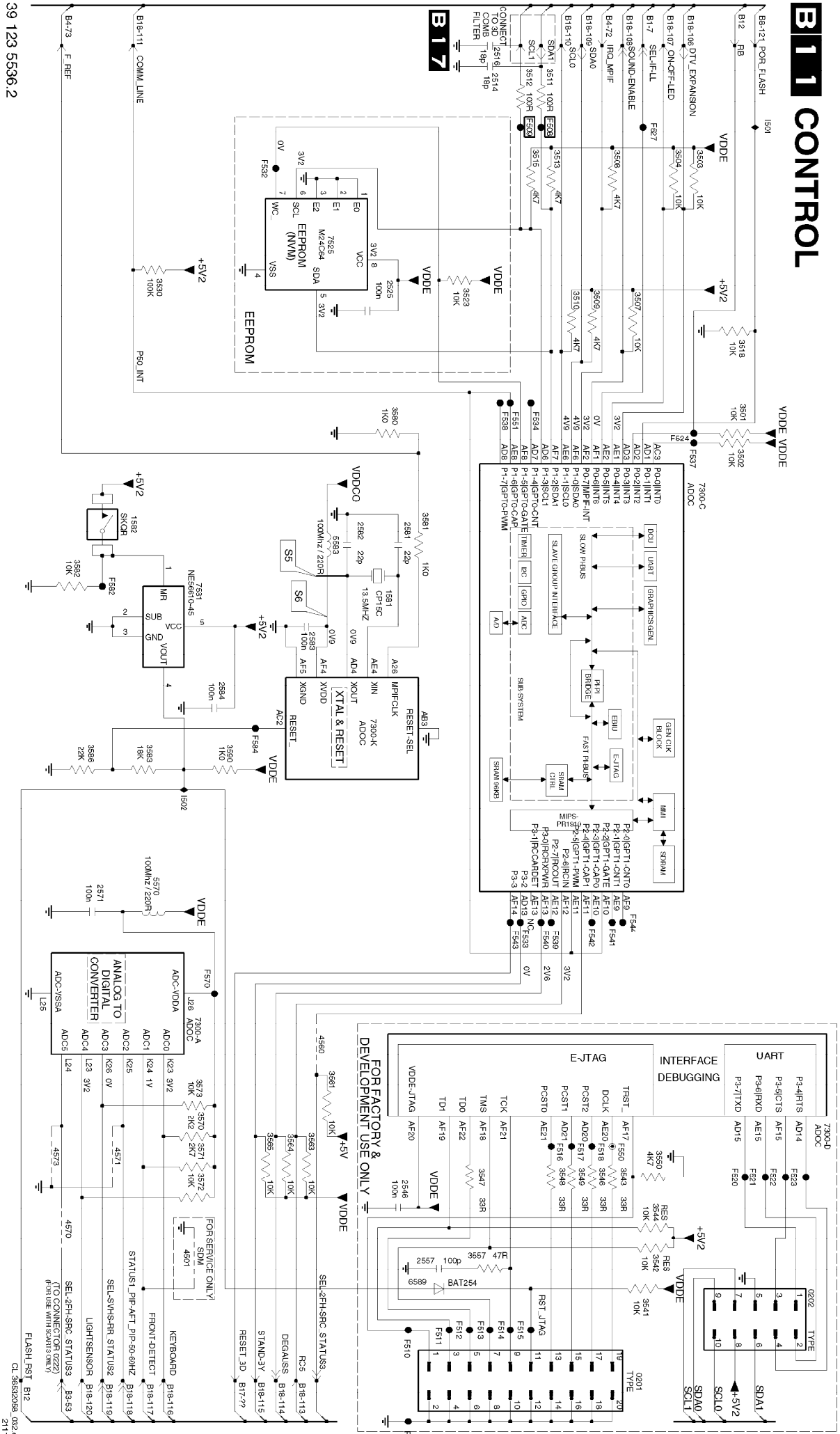
B9 PROTECTION



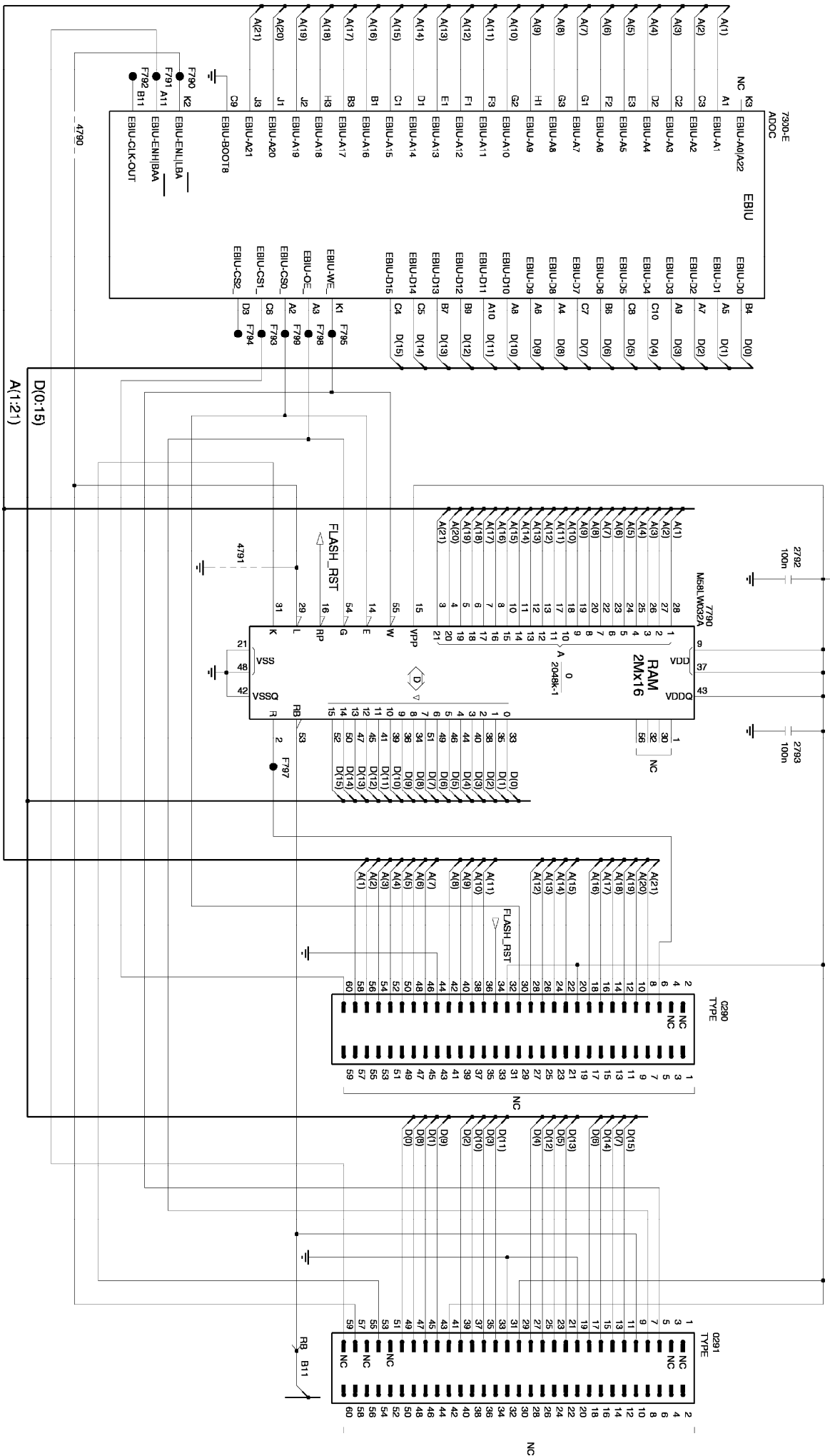


3139 123 5536.2

CL 36532058_031

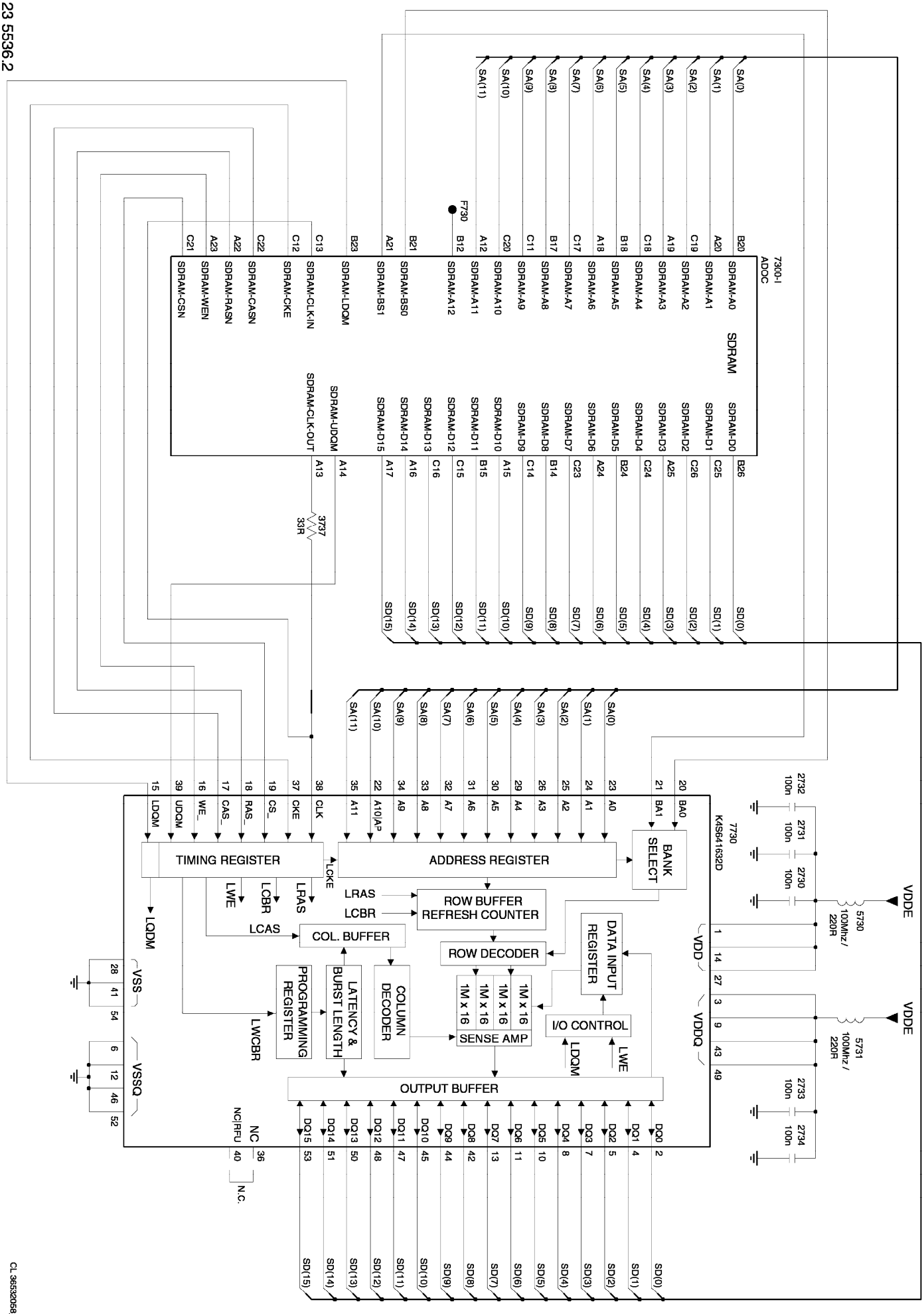

B11 CONTROL
B17
EEPROM
EEPROM (NVM)
7300-C ADOC
7300-D ADOC
7300-A ADOC
7300-K ADOC
XTAL & RESET
ANALOG TO DIGITAL CONVERTER
INTERFACE DEBUGGING
UART
E-JTAG
FOR FACTORY & DEVELOPMENT USE ONLY
FOR SERVICE ONLY
SLAVE GROUP INTERFACE
SUB-SYSTEM
FAST PI-BUS
SLOW PI-BUS
MIPS PR1935
VDDE
VDDCO
+5V2
+5V
3139 123 5536.2

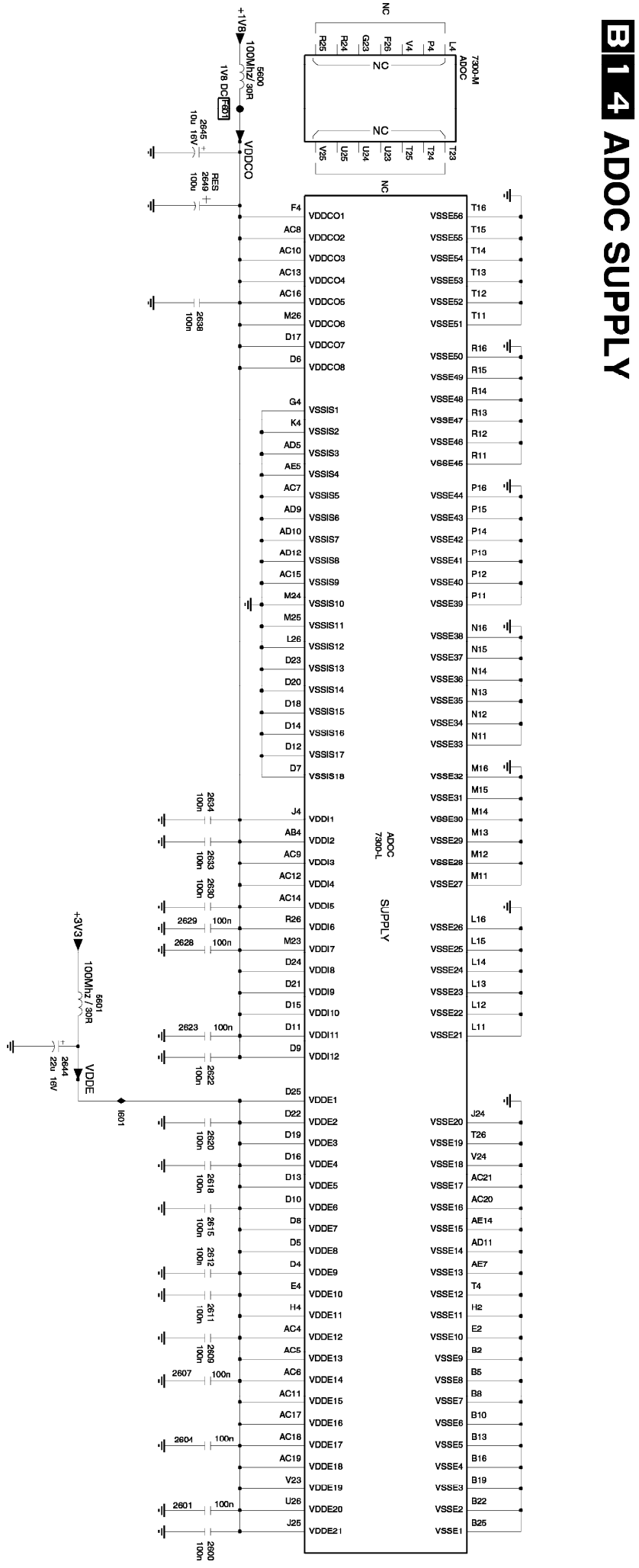
B12 CONTROL-MEMORY INTERFACE (EBIU)



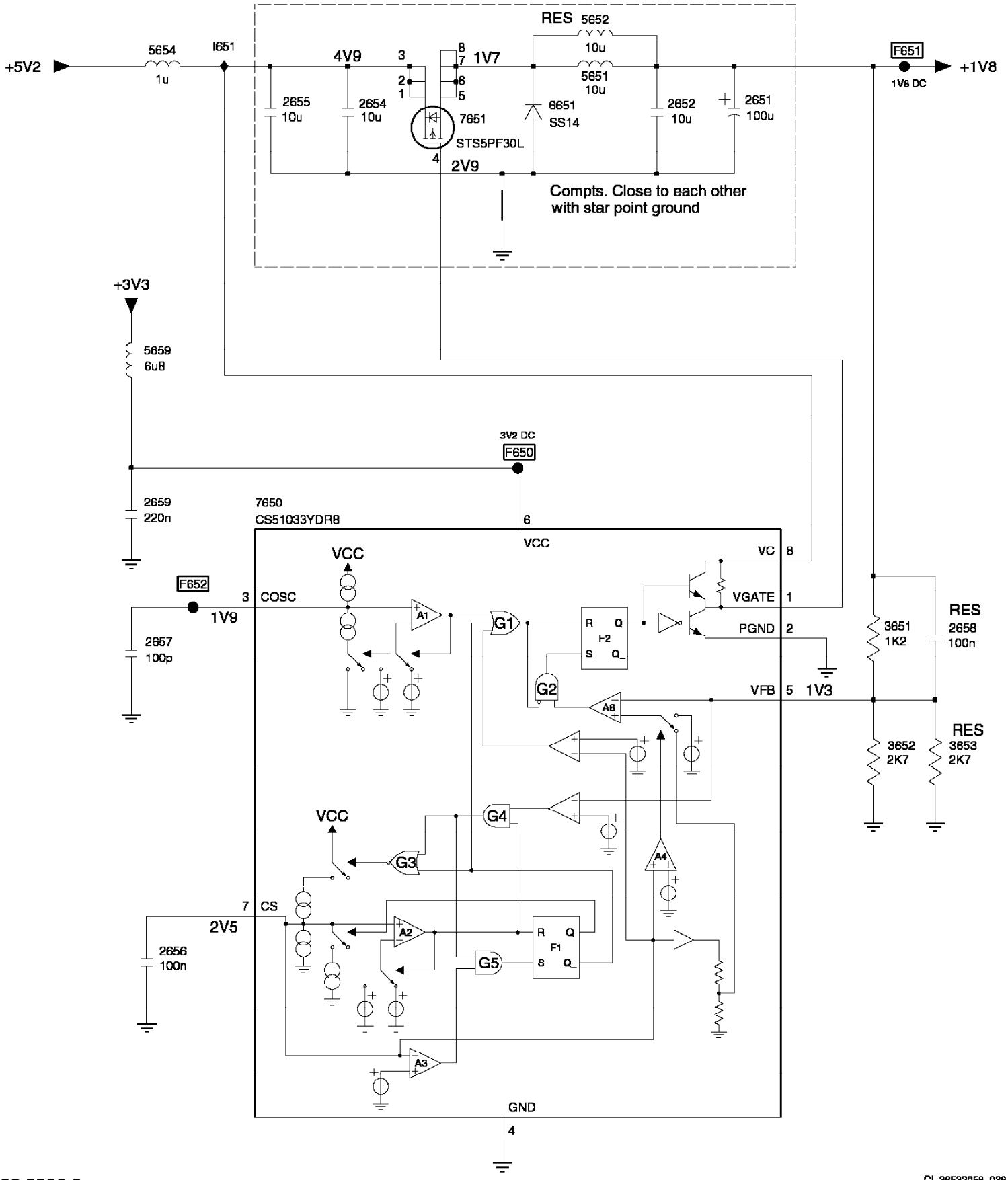
3139 123 5536.2

B13 CONTROL-MEMORY INTERFACE (SDRAM)

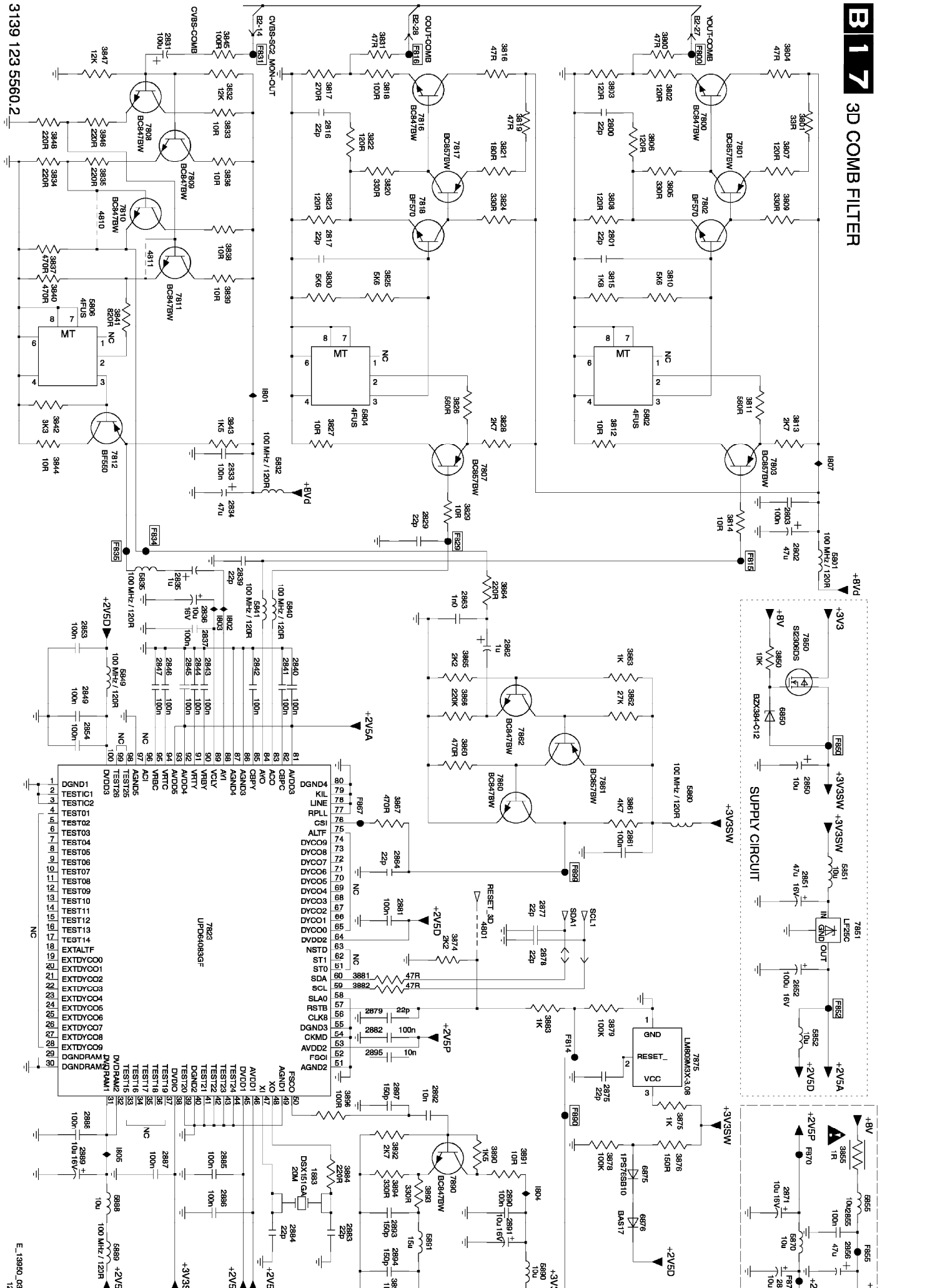



B14 ADOC SUPPLY
3139 123 5536.2
ADOC 7300-L SUPPLY
ADOC 7300-M
NC
+1V8
100Mhz / 30R
5600
1V8 DC
F601
2645 10u 16V
VDDCO
RES 2649 100u
2638 100n
+3V3
100Mhz / 30R
5601
2644 22u 16V
VDDE
I601
2634 100n
2633 100n
2630 100n
2629 100n
2628 100n
2623 100n
2622 100n
2620 100n
2618 100n
2615 100n
2612 100n
2611 100n
2609 100n
2607 100n
2604 100n
2601 100n
2600 100n
F4 VDDCO1
AC8 VDDCO2
AC10 VDDCO3
AC13 VDDCO4
AC16 VDDCO5
M26 VDDCO6
D17 VDDCO7
D6 VDDCO8
G4 VSSIS1
K4 VSSIS2
AD5 VSSIS3
AE5 VSSIS4
AC7 VSSIS5
AD9 VSSIS6
AD10 VSSIS7
AD12 VSSIS8
AC15 VSSIS9
M24 VSSIS10
M25 VSSIS11
L26 VSSIS12
D23 VSSIS13
D20 VSSIS14
D18 VSSIS15
D14 VSSIS16
D12 VSSIS17
D7 VSSIS18
J4 VDDI1
AB4 VDDI2
AC9 VDDI3
AC12 VDDI4
AC14 VDDI5
R26 VDDI6
M23 VDDI7
D24 VDDI8
D21 VDDI9
D15 VDDI10
D11 VDDI11
D9 VDDI12
D25 VDDE1
D22 VDDE2
D19 VDDE3
D16 VDDE4
D13 VDDE5
D10 VDDE6
D8 VDDE7
D5 VDDE8
D4 VDDE9
E4 VDDE10
H4 VDDE11
AC4 VDDE12
AC5 VDDE13
AC6 VDDE14
AC11 VDDE15
AC17 VDDE16
AC18 VDDE17
AC19 VDDE18
V23 VDDE19
U26 VDDE20
J25 VDDE21
T16 VSSE56
T15 VSSE55
T14 VSSE54
T13 VSSE53
T12 VSSE52
T11 VSSE51
R16 VSSE50
R15 VSSE49
R14 VSSE48
R13 VSSE47
R12 VSSE46
R11 VSSE45
P16 VSSE44
P15 VSSE43
P14 VSSE42
P13 VSSE41
P12 VSSE40
P11 VSSE39
N16 VSSE38
N15 VSSE37
N14 VSSE36
N13 VSSE35
N12 VSSE34
N11 VSSE33
M16 VSSE32
M15 VSSE31
M14 VSSE30
M13 VSSE29
M12 VSSE28
M11 VSSE27
L16 VSSE26
L15 VSSE25
L14 VSSE24
L13 VSSE23
L12 VSSE22
L11 VSSE21
J24 VSSE20
T26 VSSE19
V24 VSSE18
AC21 VSSE17
AC20 VSSE16
AE14 VSSE15
AD11 VSSE14
AE7 VSSE13
T4 VSSE12
H2 VSSE11
E2 VSSE10
B2 VSSE9
B5 VSSE8
B8 VSSE7
B10 VSSE6
B13 VSSE5
B16 VSSE4
B19 VSSE3
B22 VSSE2
B25 VSSE1
NC R25 R24 G23 F26 V4 P4 L4
NC V25 U25 U24 U23 T25 T24 T23
CL 36532058_035.
030

B15 LOW VOLTAGE SUPPLY - ADOC

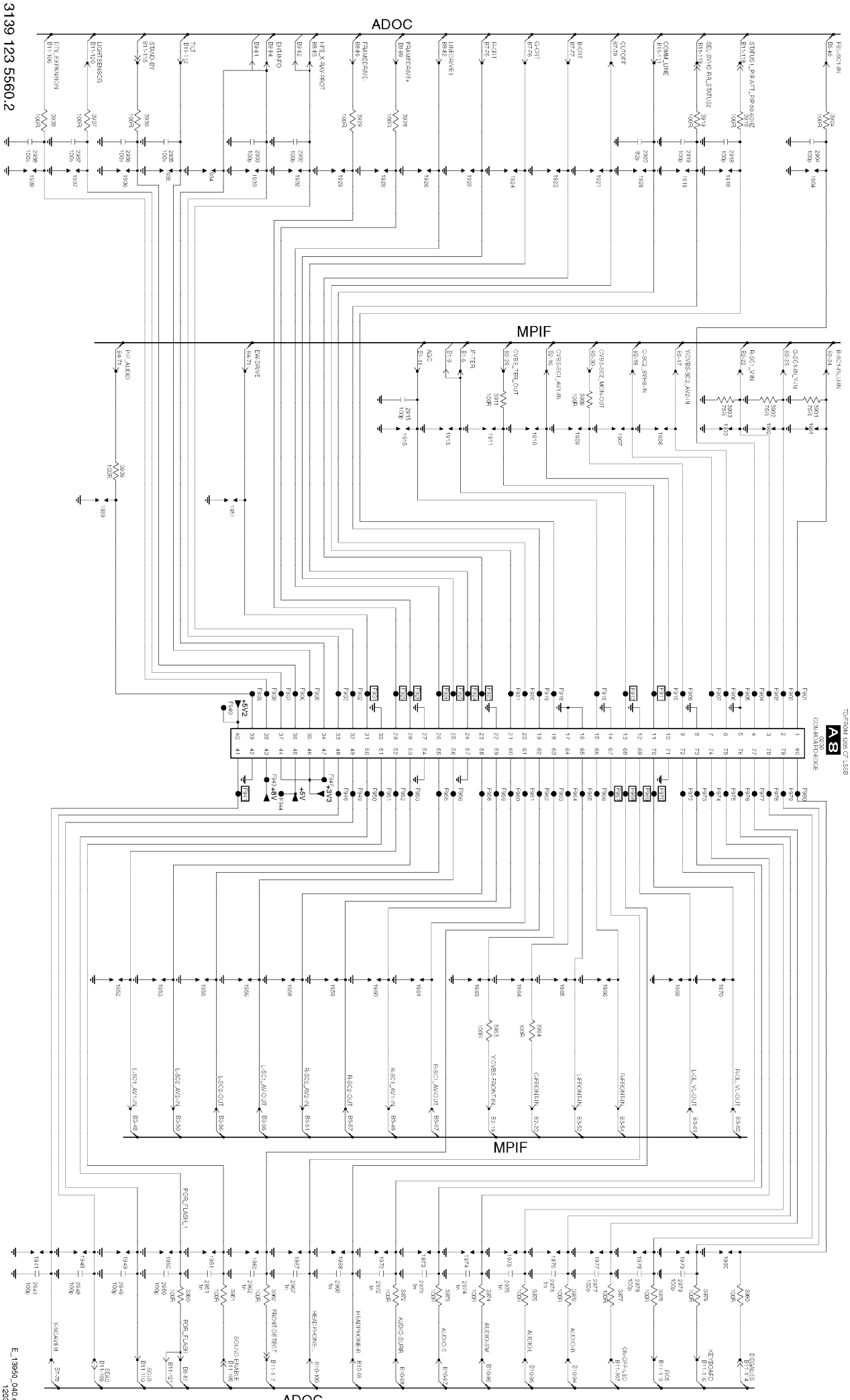


CL 36532058_036.eps
211103

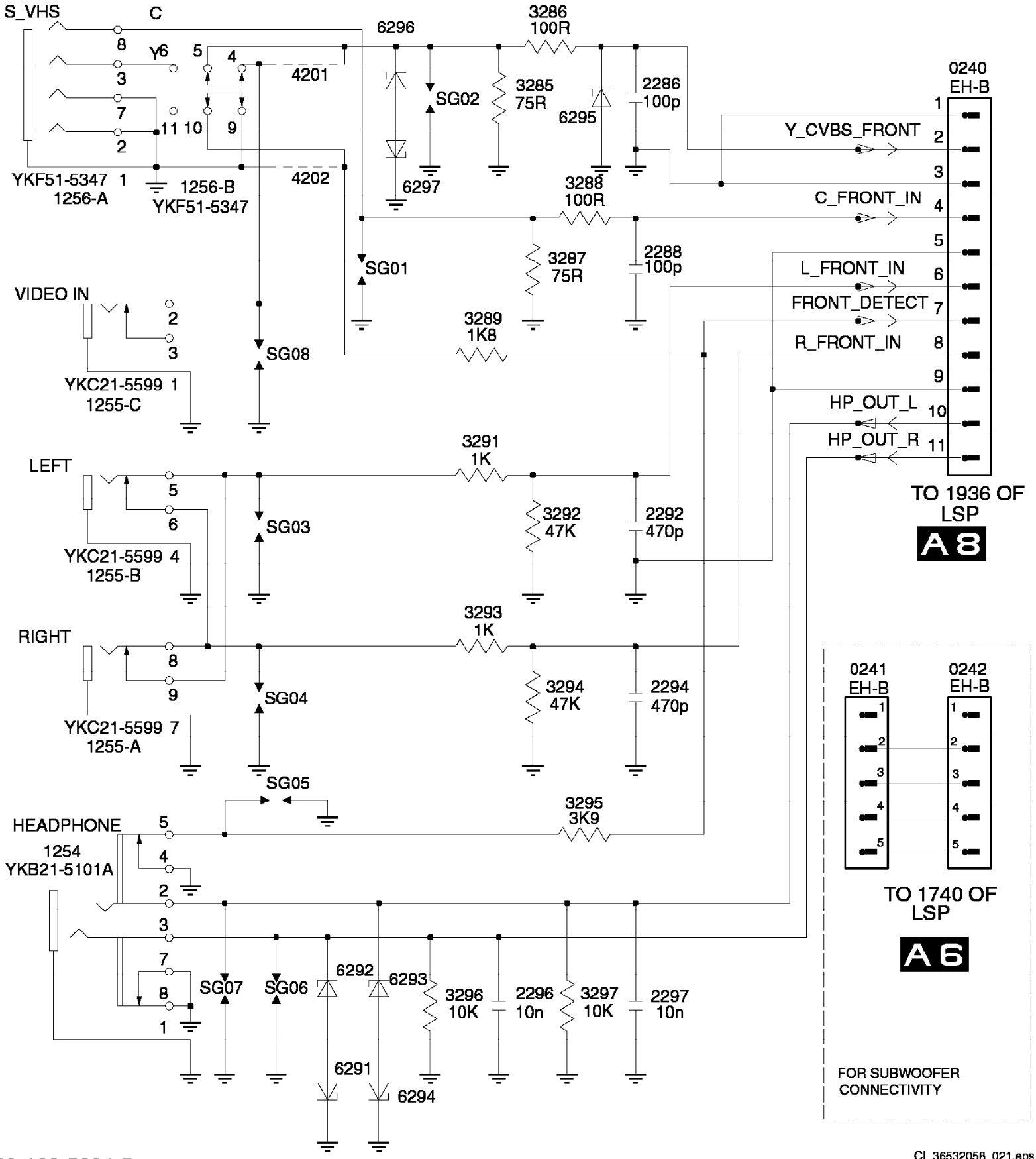

B17
3D COMB FILTER
3139 123 5560.2
CVBS-COMB
CVBS-SC2_MON-OUT
COUT-COMB
YOUT-COMB
SUPPLY CIRCUIT
+8Vd
+3V3
+3V3SW
+2V5A
+2V5D
+2V5P
+2V5
+3V3SW
MT
NC
UPD64083GF
LM809M3X-3.08
LF25C
BC847BW
BC857BW
BF570
BF560
BZX384-C12
BAS17
1PS76SB10
DSX151GA
RESET_3D
SDA1
SCL1

B18 SSB-CONNECTOR INTERFACE

3139 123 5560.2

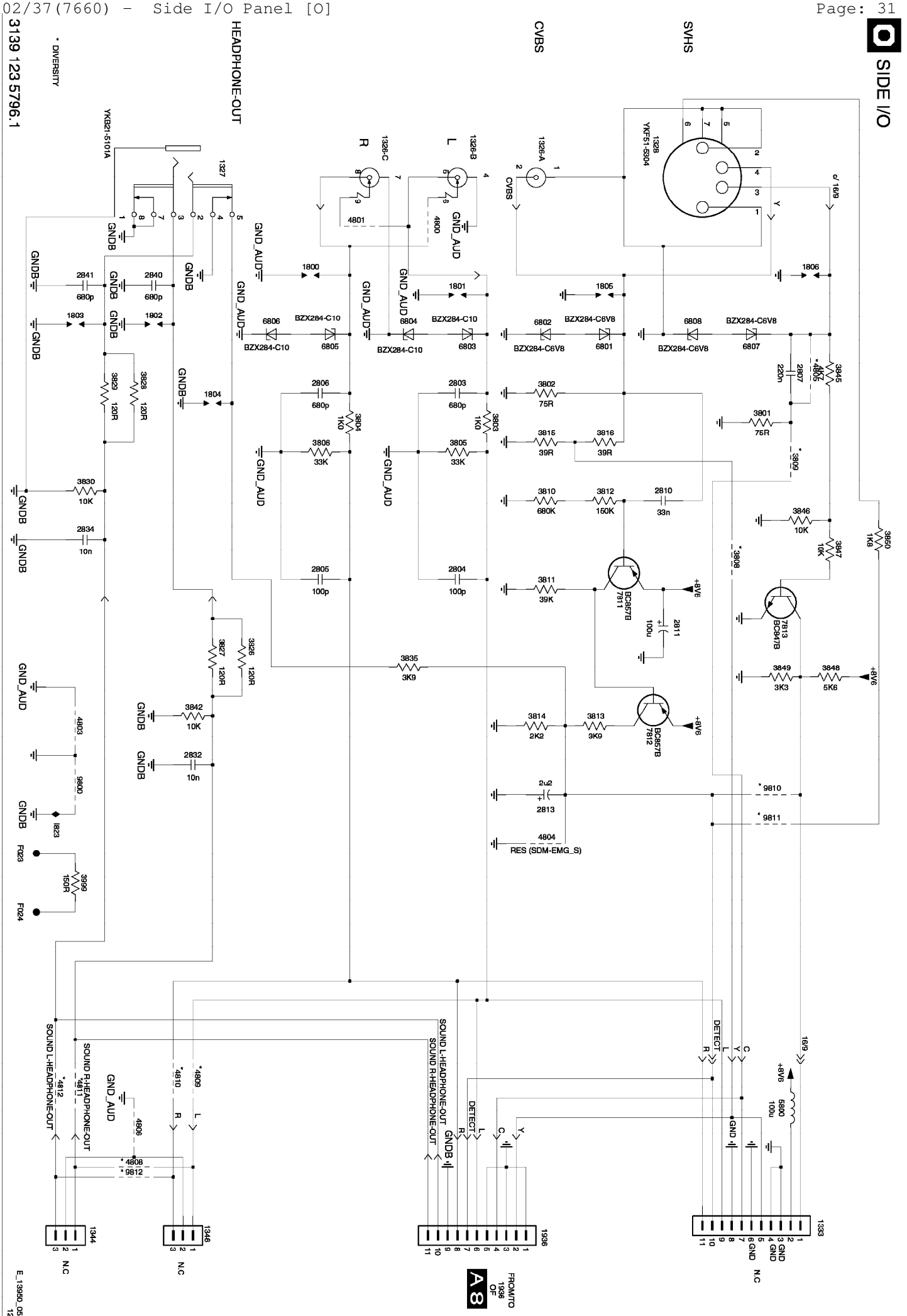


SIDE IO PANEL

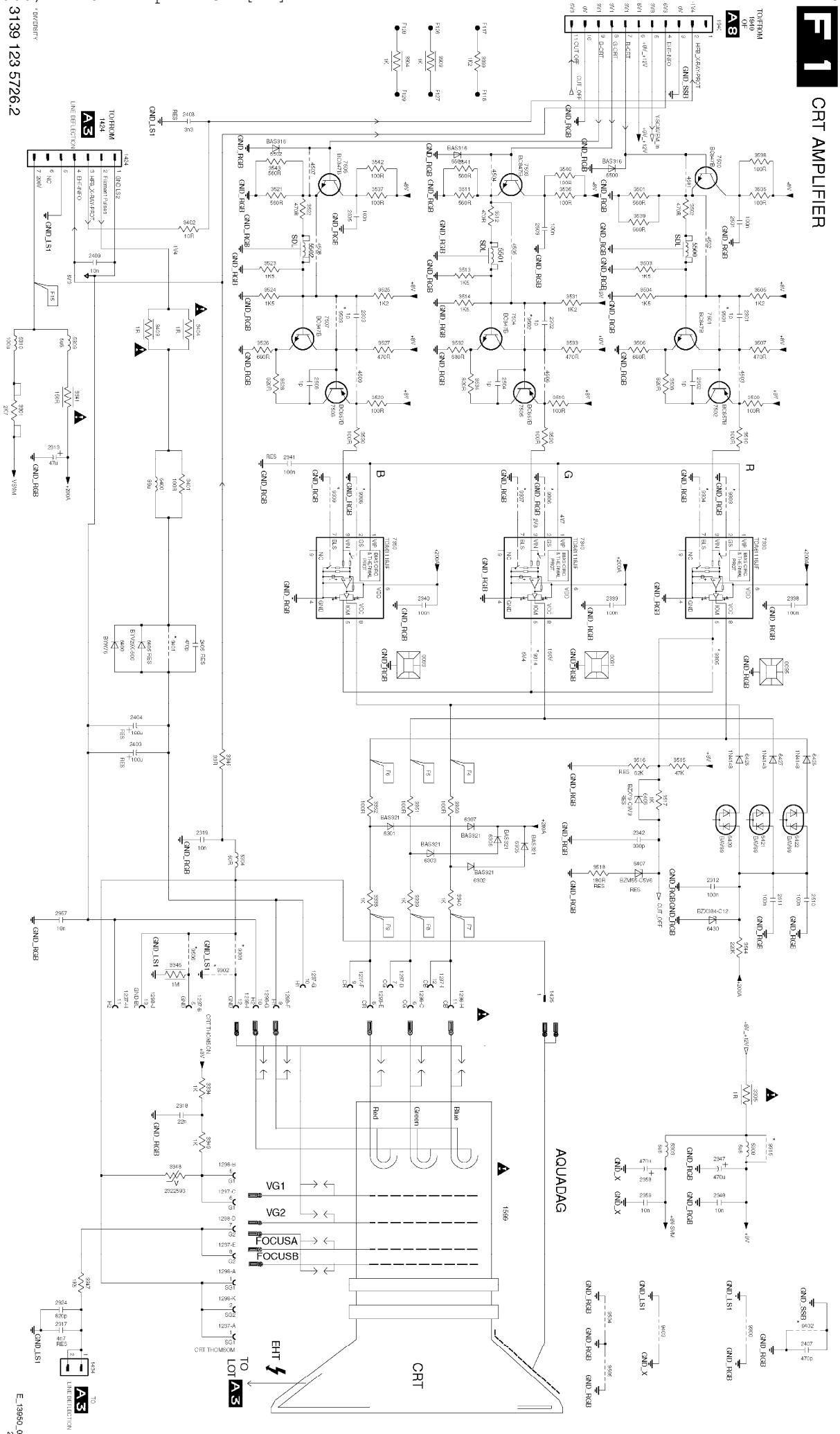


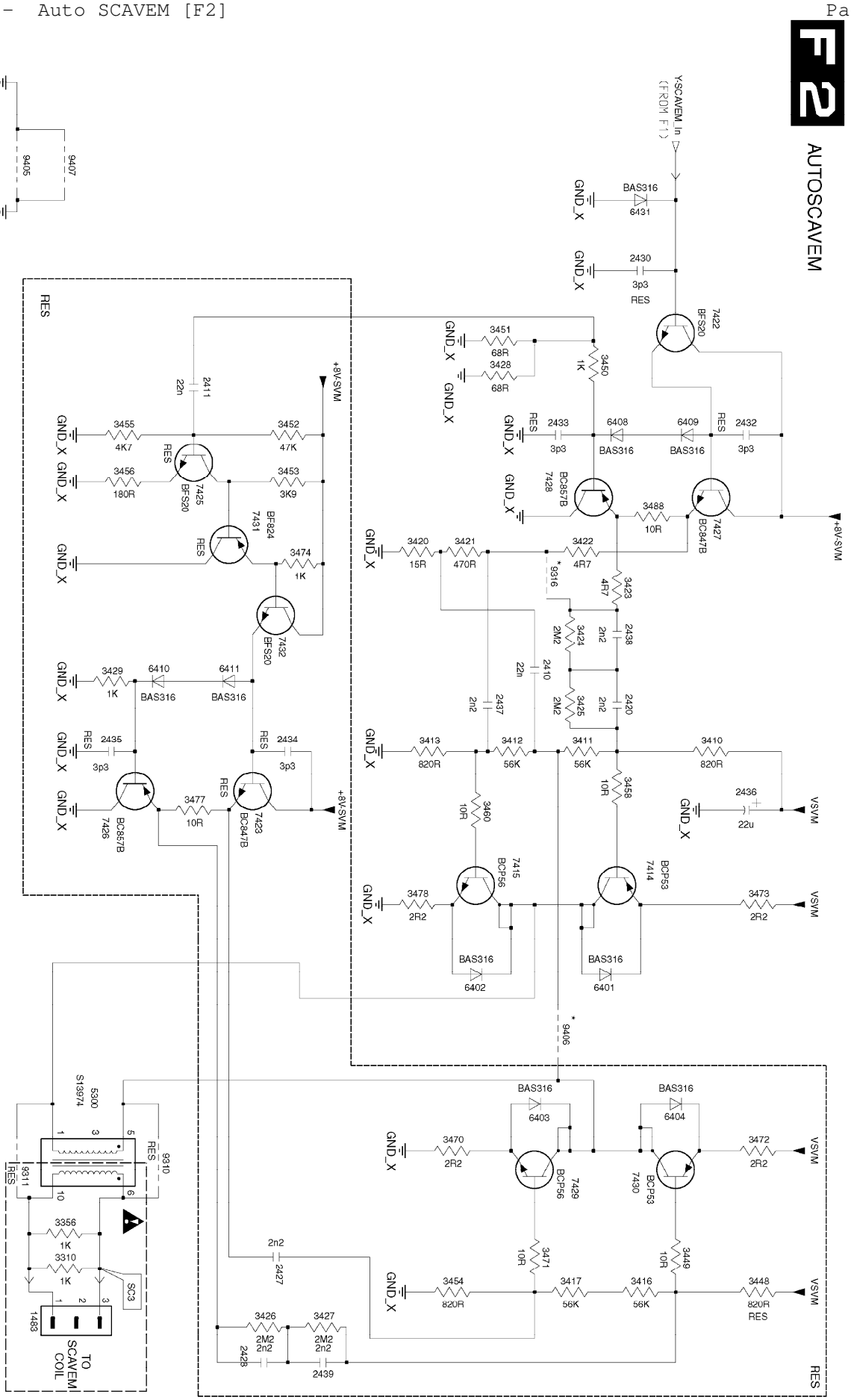
3139 123 5291.5

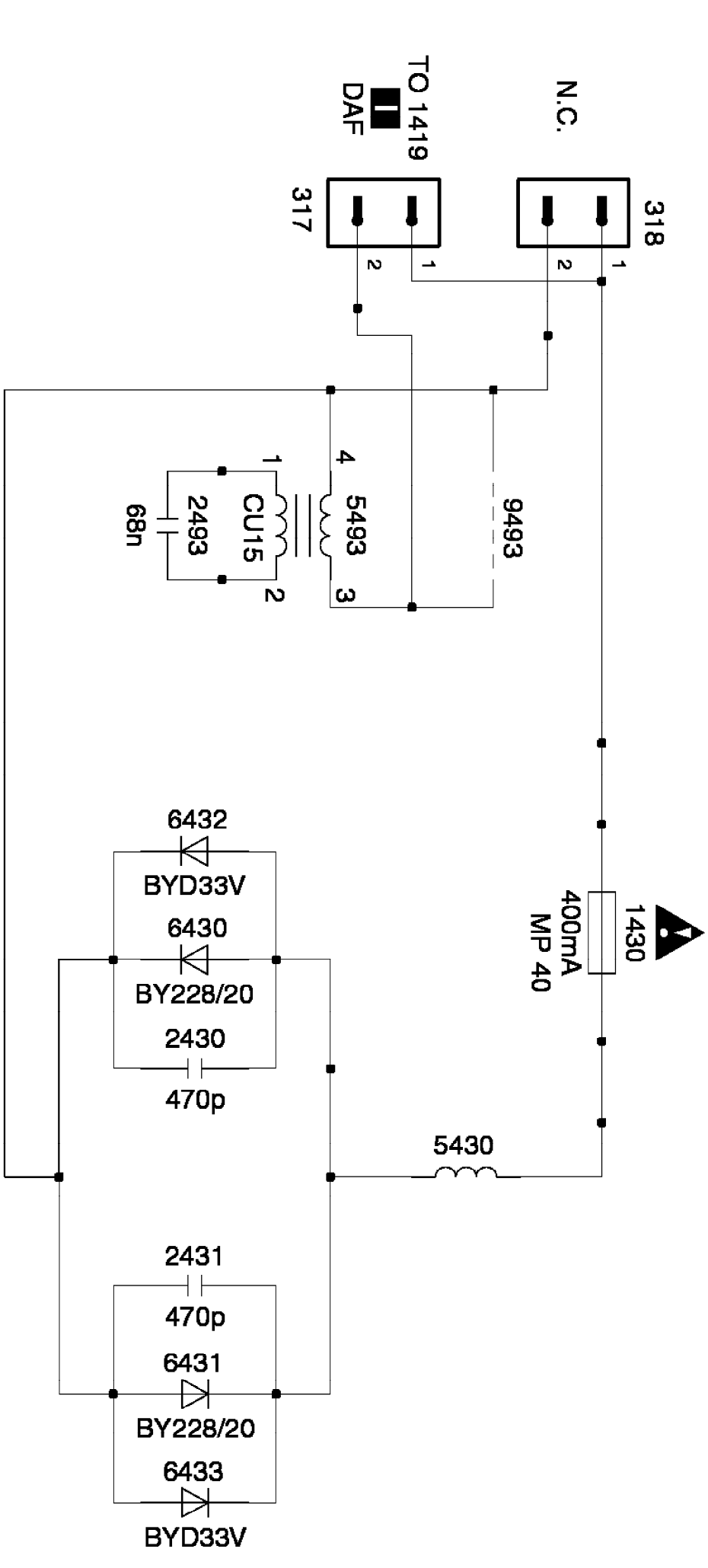
CL 36532058_021.eps
210803


SIDE I/O
SVHS
CVBS
HEADPHONE-OUT
3139 123 5796.1
* DIVERSITY
YKB21-5101A
1327
1326-A
1326-B
1326-C
1328
YKF51-5304
16/9
BZX284-C10
BZX284-C6V8
BC857B
BC847B
GND_AUD
GNDB
+8V6
SOUND L-HEADPHONE-OUT
SOUND R-HEADPHONE-OUT
DETECT
RES (SDM-EMG_S)
FROM/TO 1936 OF A8
N.C

F1 CRT AMPLIFIER

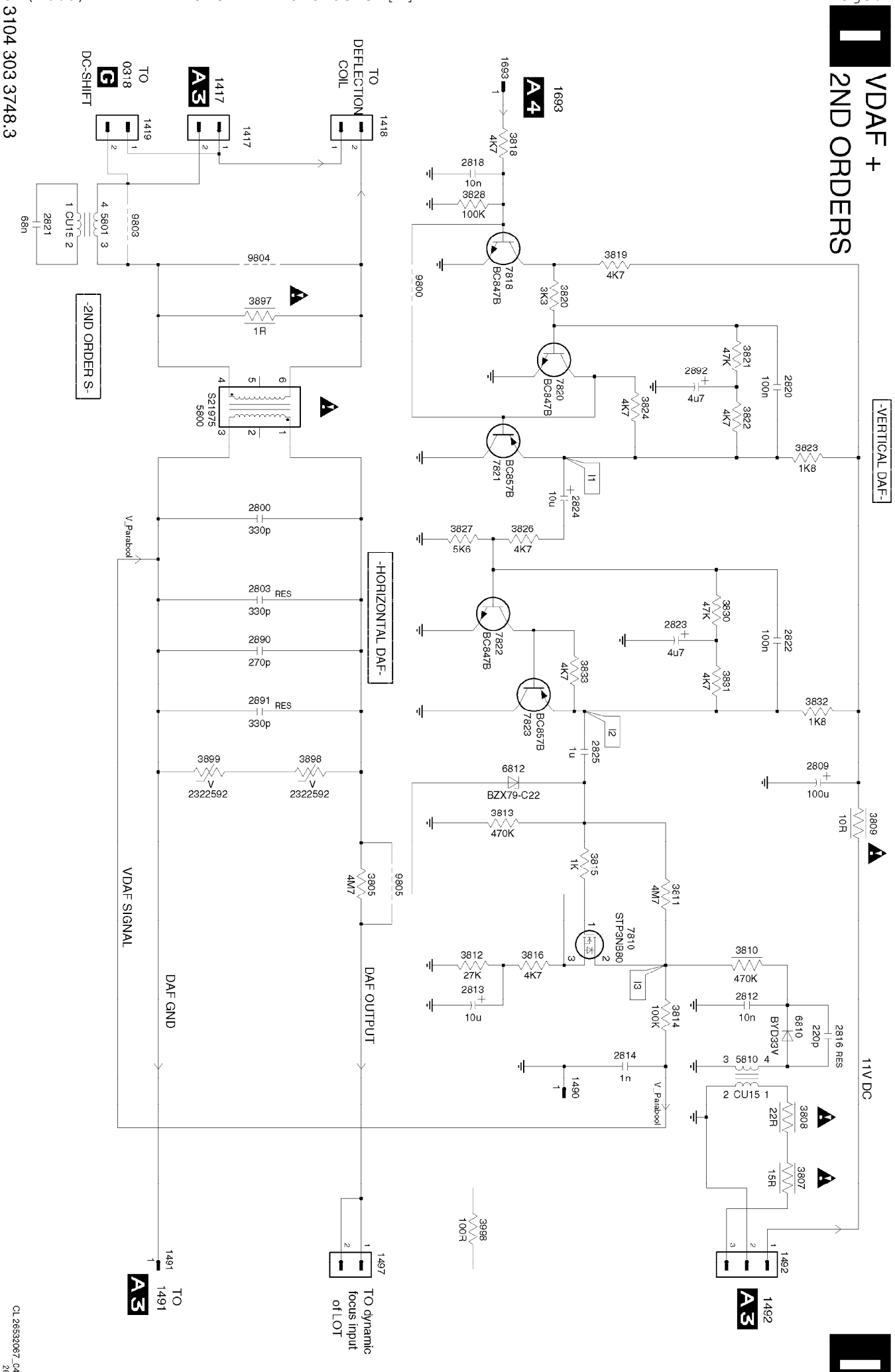



F2
AUTOSCAVEM
3139 123 5726.2
* DIVERSITY
Y-SCAVEM In (FROM F1)
GND_X
GND_RGB
9405
9407
BAS316
6431
2430
3p3
RES
BFS20
7422
3451
68R
3428
68R
1K
3450
2433
6408
6409
2432
BC857B
7428
BC847B
7427
3488
10R
+8V-SVM
3420
15R
3421
470R
3422
4R7
*9316
3423
4R7
3424
2M2
2438
2n2
2410
22n
2437
3425
2M2
2420
3413
820R
3412
56K
3411
56K
3410
820R
3458
10R
3460
10R
2436
22u
VSVM
BCP56
7415
BCP53
7414
3478
2R2
3473
2R2
BAS316
6402
BAS316
6401
*9406
2411
22n
3455
4K7
3452
47K
3456
180R
3453
3K9
BFS20
7425
BF824
7431
3474
1K
BFS20
7432
3429
1K
6410
6411
BAS316
BAS316
2435
2434
3p3
3p3
3477
10R
BC857B
7426
BC847B
7423
5300
S13974
9310
9311
3356
1K
3310
1K
SC3
1483
TO SCAVEM COIL
2n2
2427
3426
2M2
2n2
2428
3427
2M2
2n2
2439
BAS316
6403
BAS316
6404
3470
2R2
3472
2R2
BCP56
7429
BCP53
7430
3471
10R
3449
10R
3454
820R
3417
56K
3416
56K
3448
820R
RES



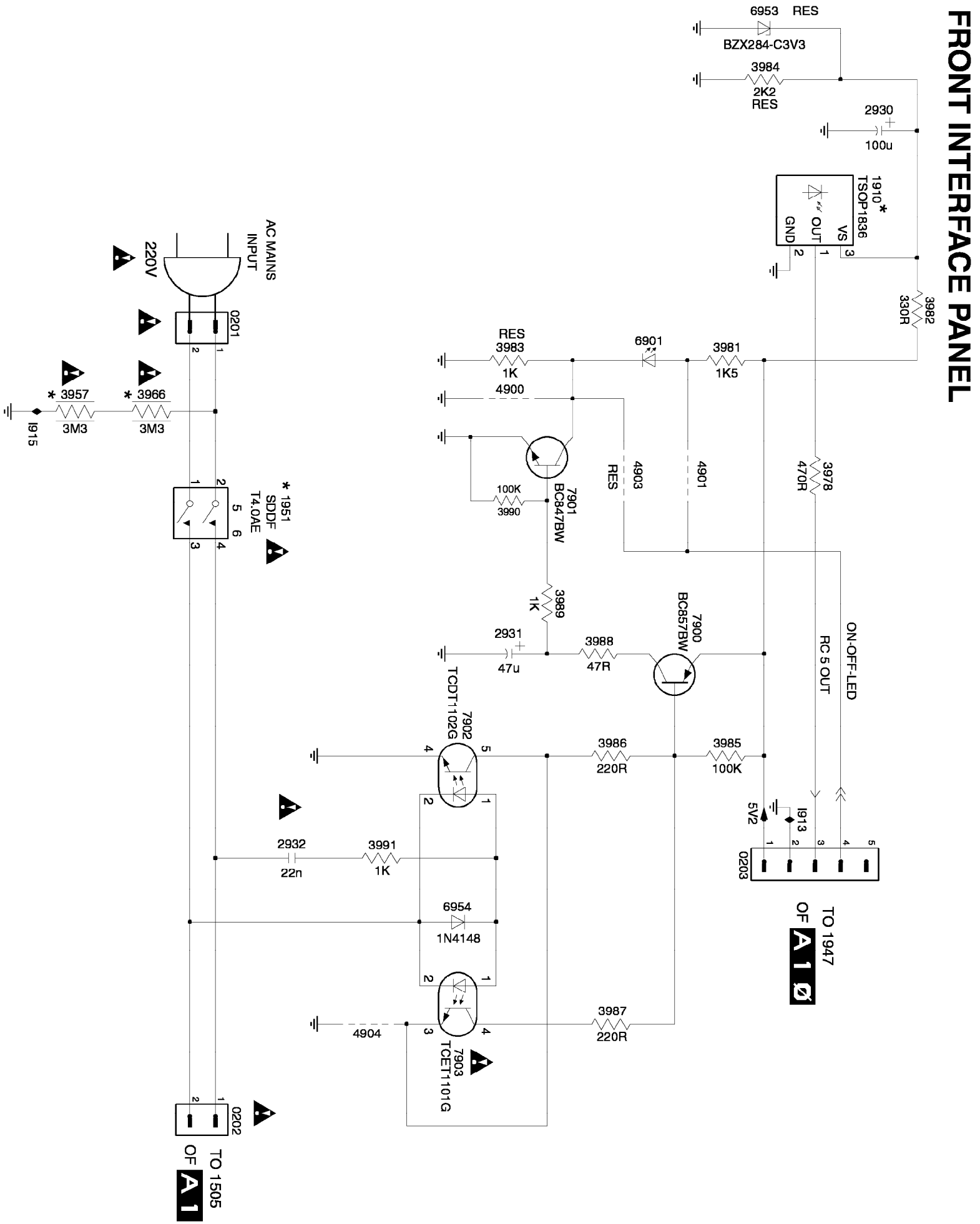
3104 303 3654.5

CL 2653041_034.eps
211103

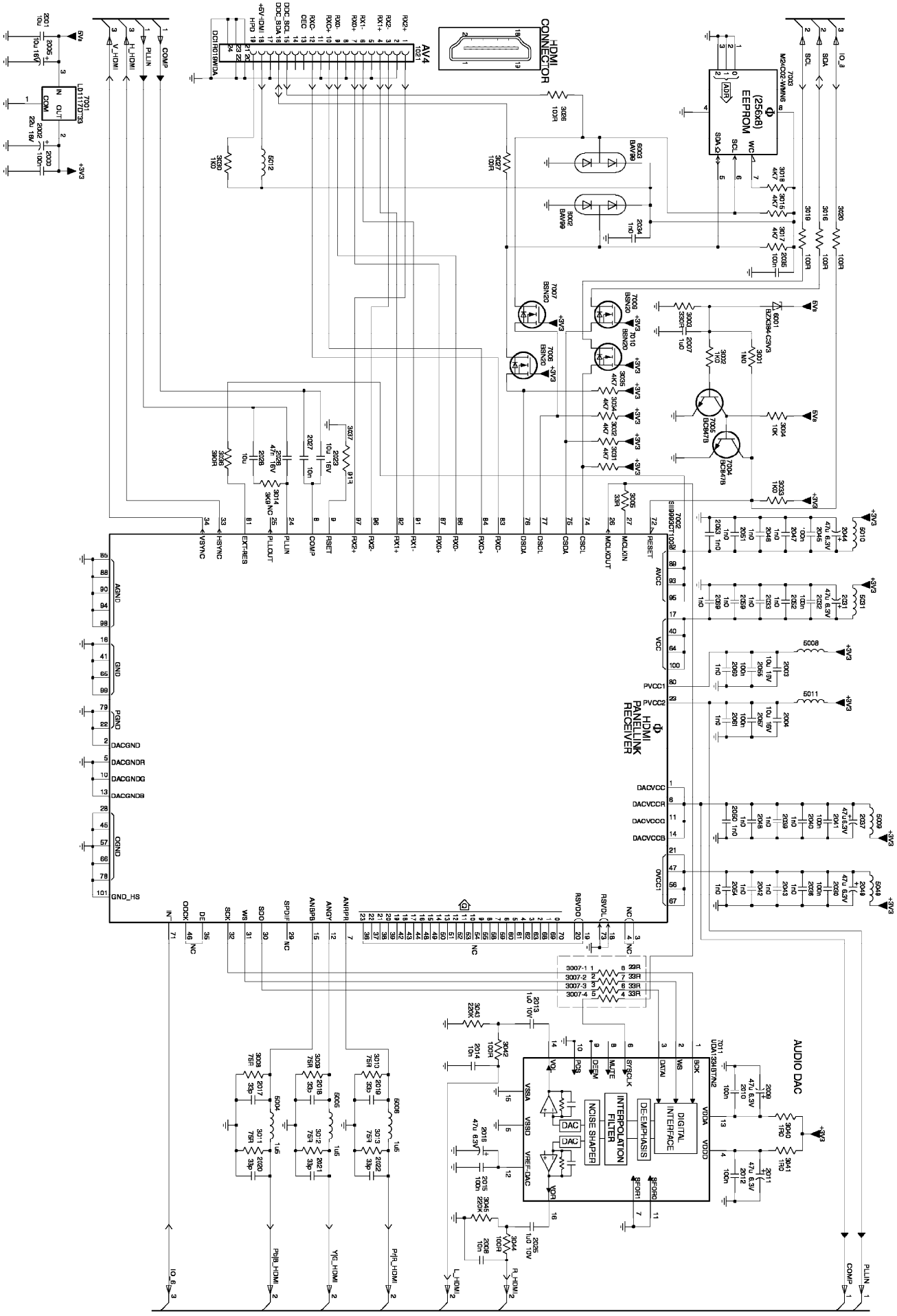

I
VDAF +
2ND ORDERS
3104 303 3748.3
TO DEFLECTION COIL
1418
TO 0318 DC-SHIFT
G
1419
A3
1417
1417
1693
A4
1693
3818
4K7
2818
10n
3828
100K
7818
BC847B
3819
4K7
9800
3820
3K3
7820
BC847B
3821
47K
2892
4u7
2820
100n
3824
4K7
3822
4K7
7821
BC857B
3823
1K8
I1
2824
10u
-VERTICAL DAF-
9803
9804
1 CU15 2
4 5801 3
2821
68n
3897
1R
-2ND ORDER S-
S21975
5800
3827
5K6
3826
4K7
2800
330p
V_Parabool
2803 RES
330p
2890
270p
2891 RES
330p
-HORIZONTAL DAF-
3899
V
2322592
3898
V
2322592
7822
BC847B
3830
47K
2823
4u7
2822
100n
3833
4K7
3831
4K7
7823
BC857B
3832
1K8
I2
2825
1u
6812
BZX79-C22
2809
100u
3809
10R
3813
470K
3815
1K
3611
4M7
3805
4M7
9805
7810
STP3NB80
3812
27K
3816
4K7
3810
470K
2813
10u
I3
3814
100K
2812
10n
6810
BYD33V
2816 RES
220p
2814
1n
1490
3 5810 4
2 CU15 1
3808
22R
3807
15R
11V DC
VDAF SIGNAL
DAF GND
DAF OUTPUT
V_Parabool
3998
100R
1497
TO dynamic focus input of LOT
1492
A3
1492
1491
A3
TO 1491
I

3139 123 5499.2

J FRONT INTERFACE PANEL



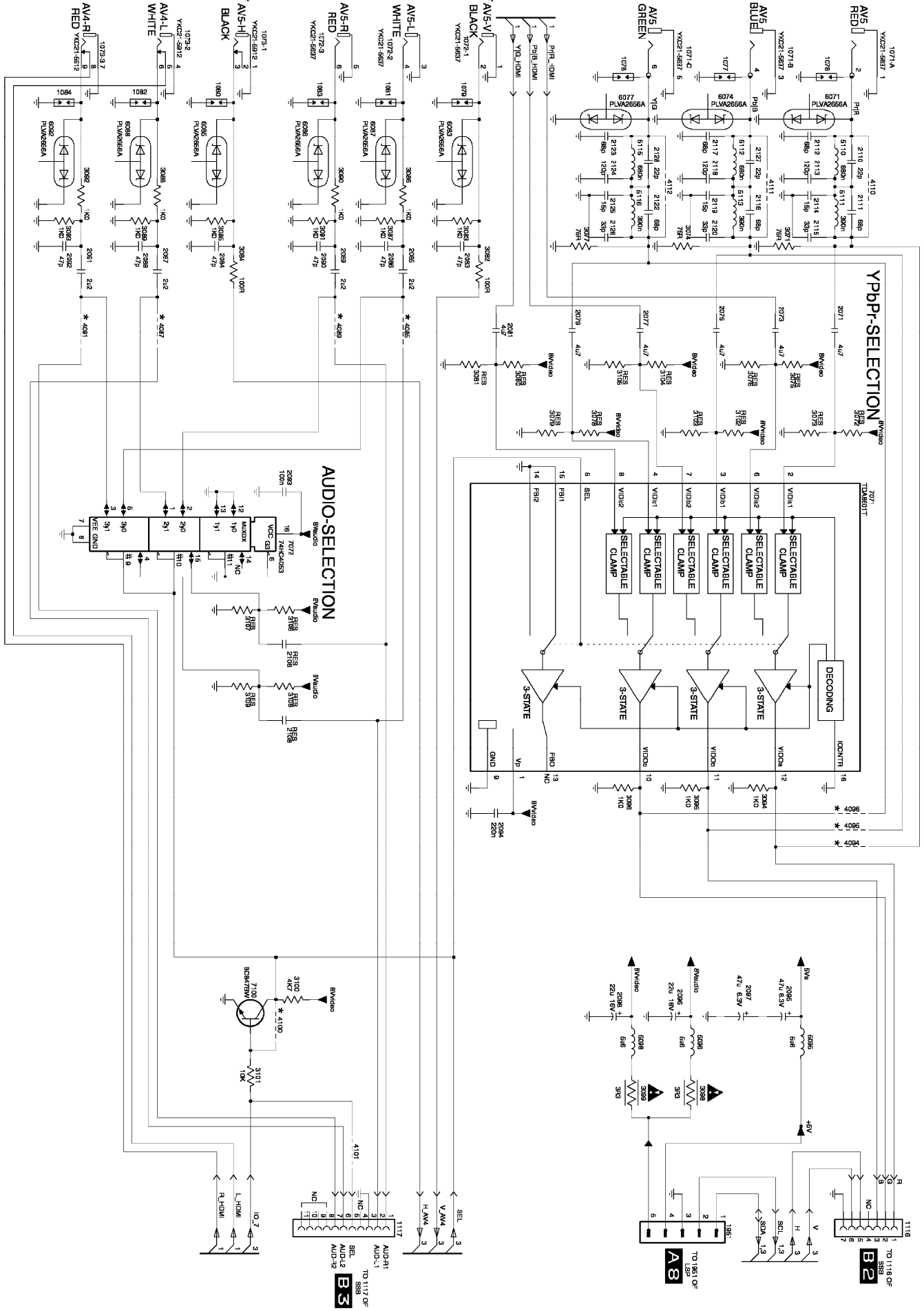
M1 HDMI PANELLINK RECEIVER



3139 123 5743.2

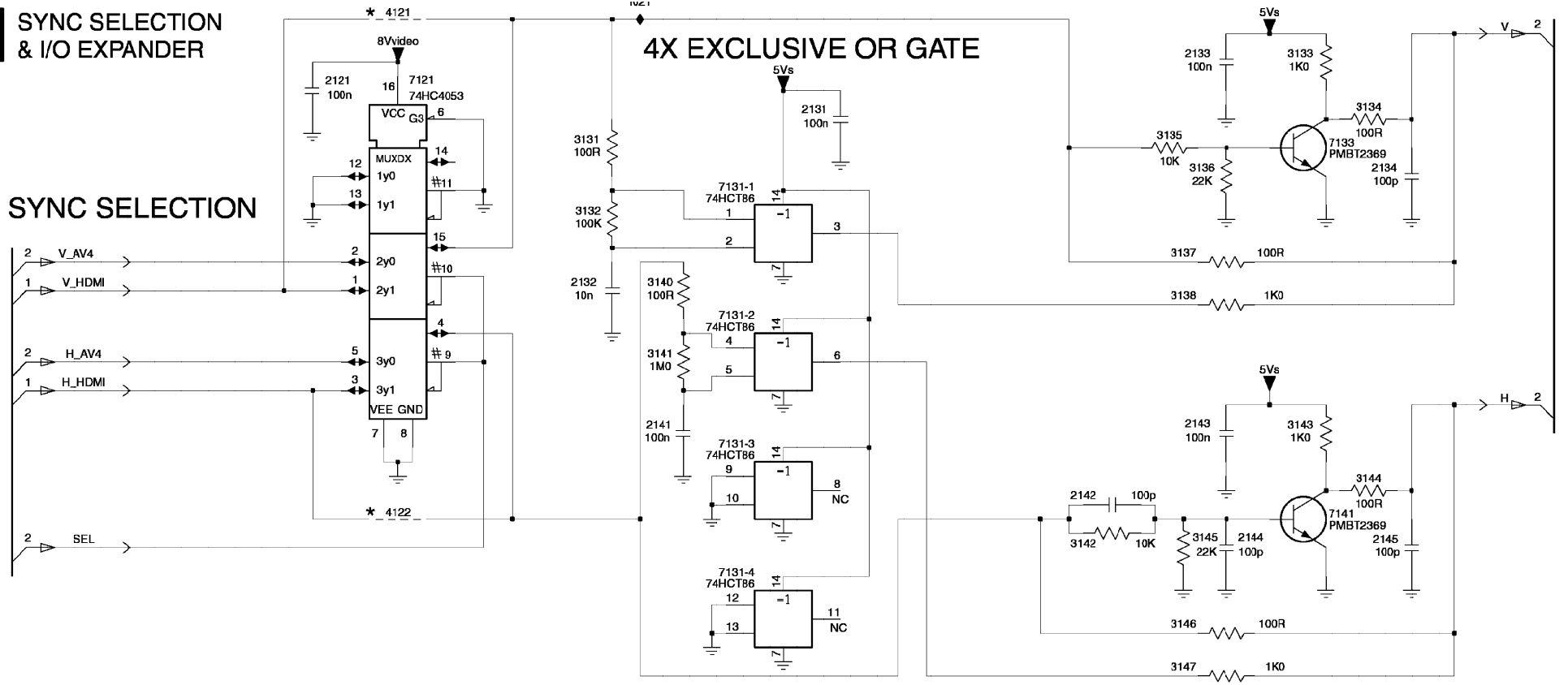
E_13950_050.eps
120306

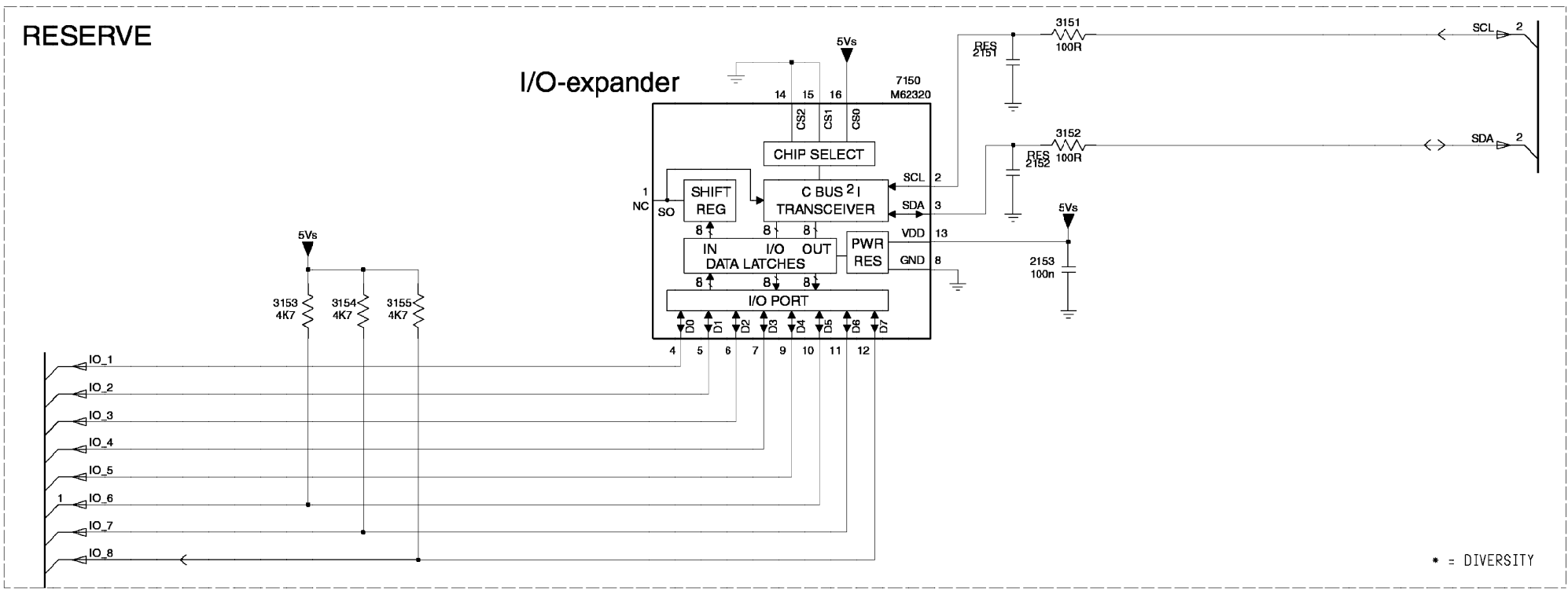
M2 INPUT SELECTION



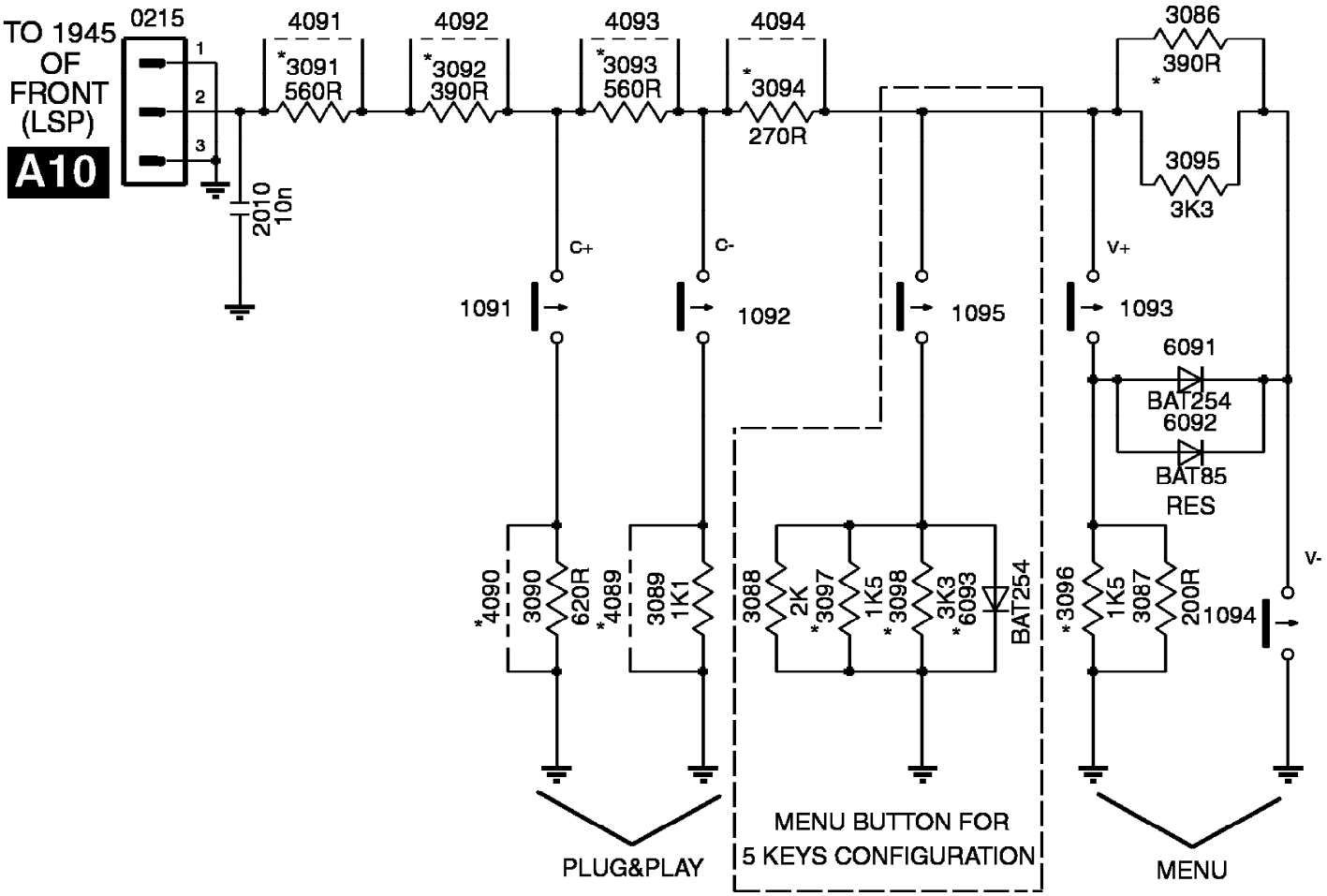
3139 123 5743.2

M3 SYNC SELECTION & I/O EXPANDER

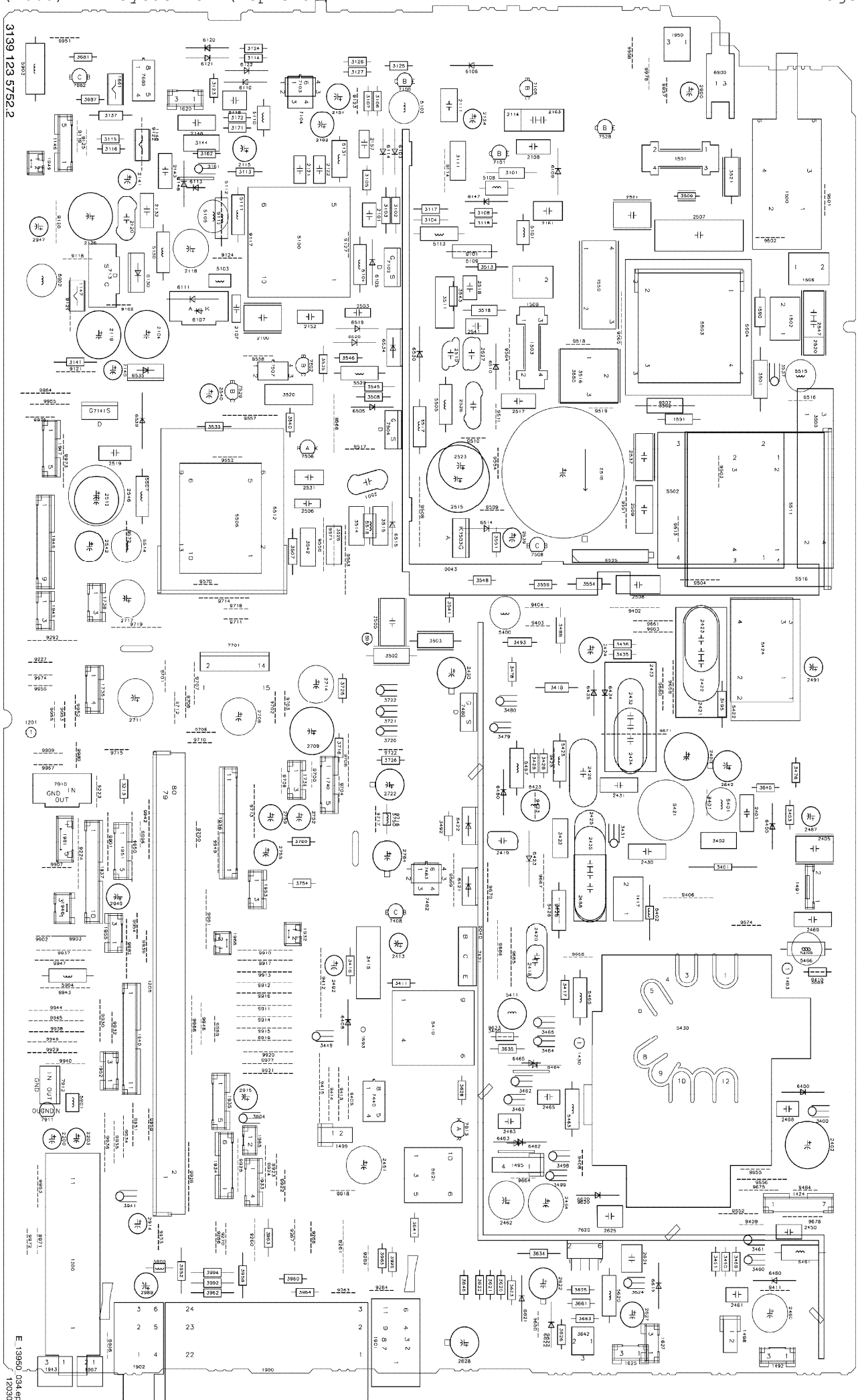




P TOP CONTROL PANEL (PV2)

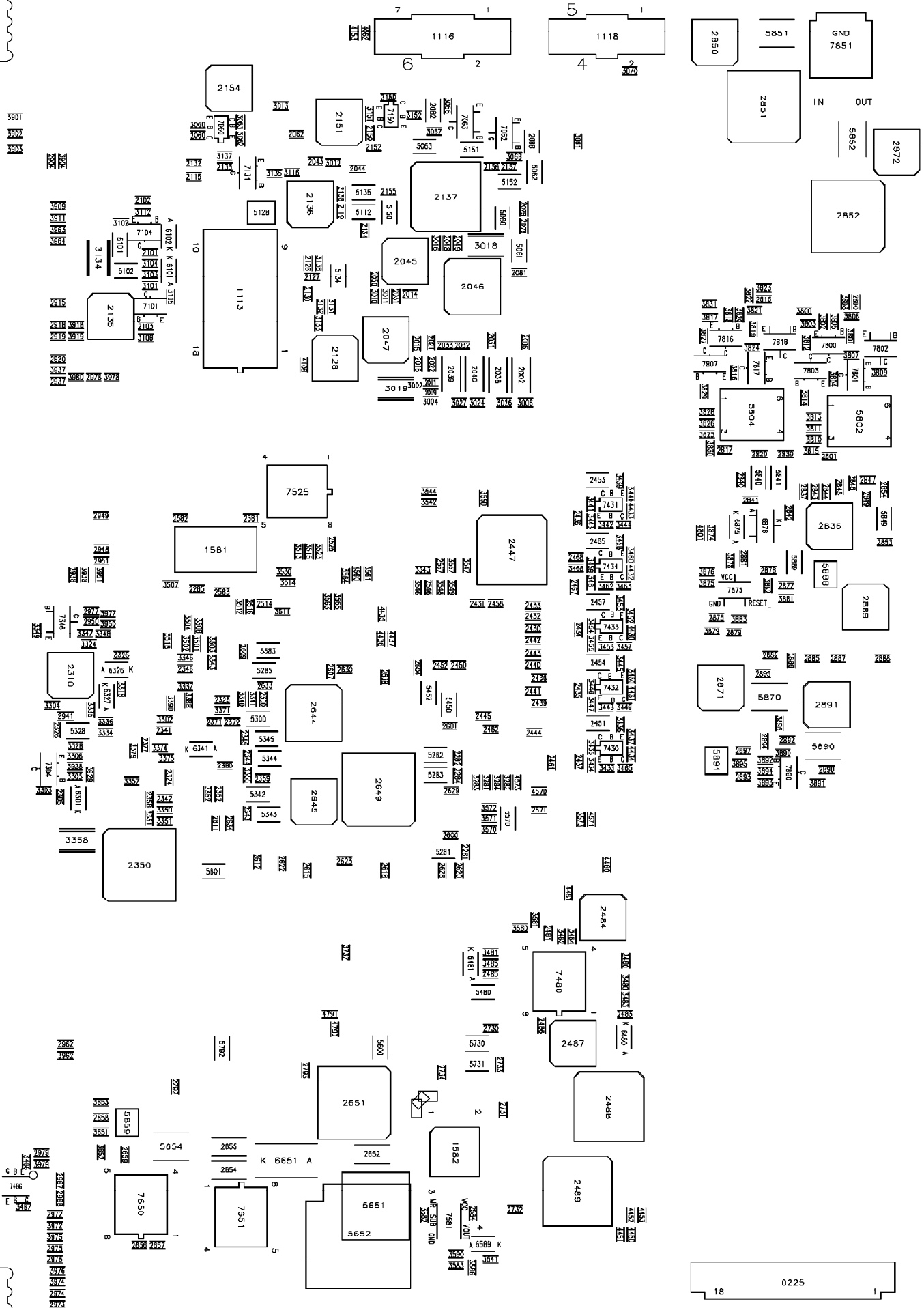


E_13950_069.eps

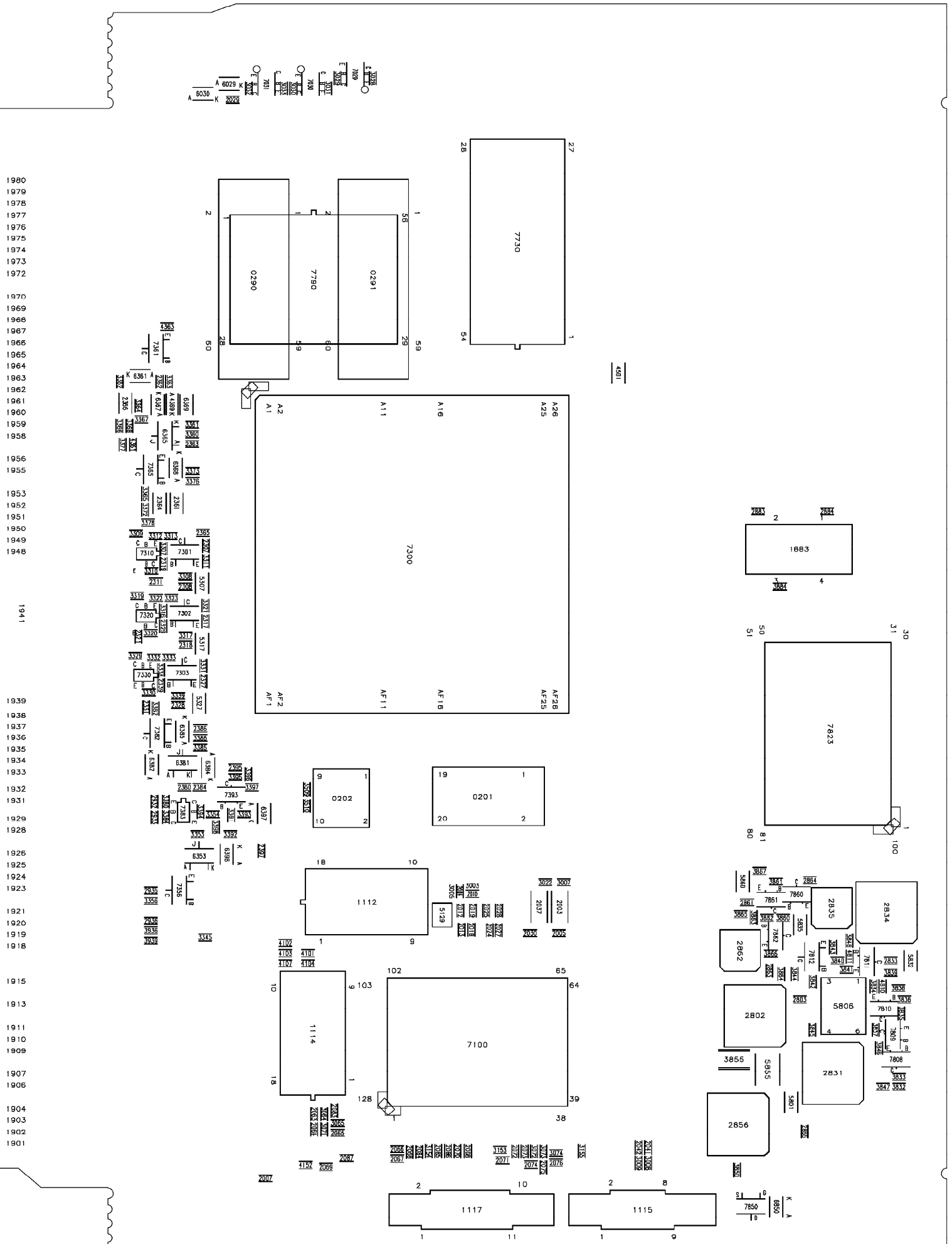

3139 123 5752.2
E 13950 034.eps
120306

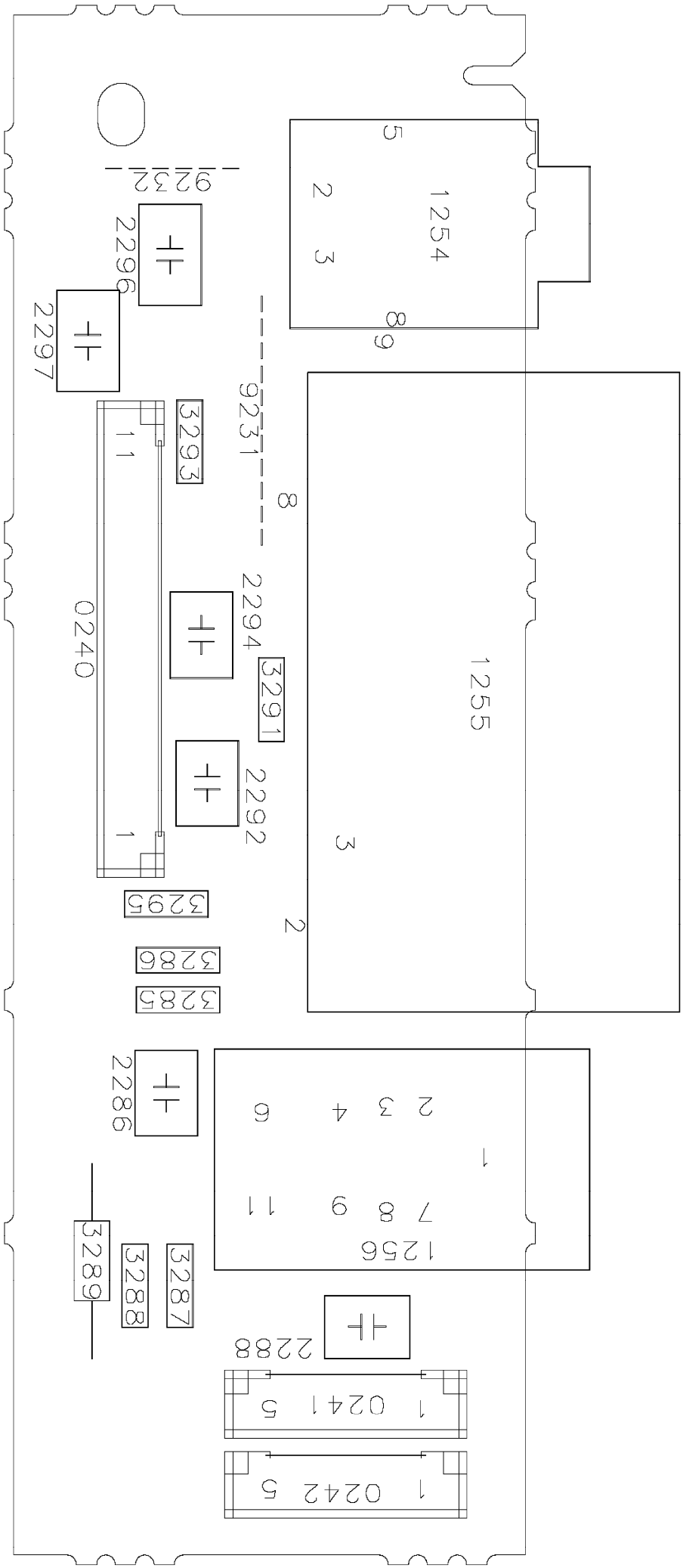
3139 123 5752.2
ATTENTION : LIVE PARTS
E_13950_035.eps
110304

3139 123 5560.2



3139 123 5560.2




1254
2296
2297
9231
3293
2294
0240
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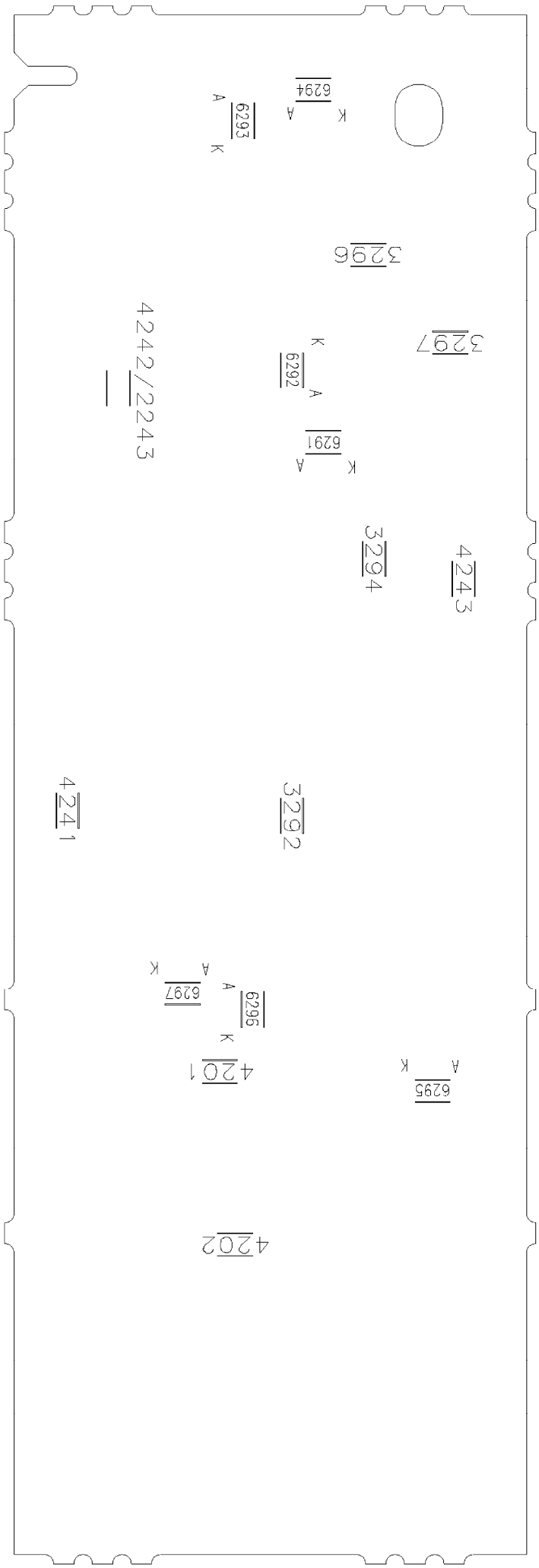
1255
3295
3286
3285
2286
1256
3289
3288
3287
2288
0241
0242


6294
A
K
6293
K
A
3296
4242/2243
6292
K
A
6291
A
K
3297
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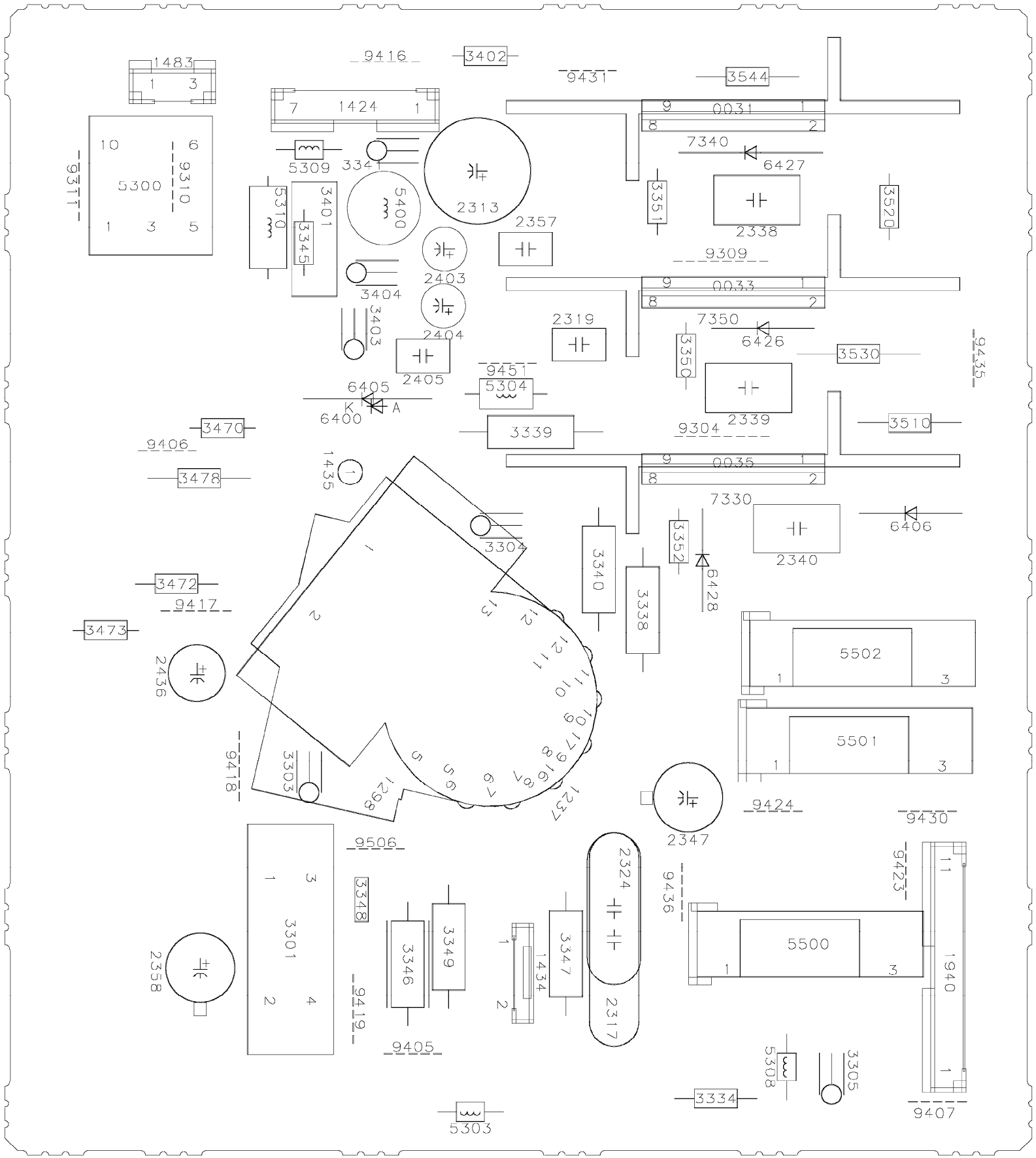
4243
4241
3292
6297
A
K
6296
K
A
4201
6295
A
K
4202

3139 123 5726.2



6431
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6306
6303
6420
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6307
6301
6302
6305
6407
6500
6501
6502
7428
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7500
7501
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7503
7504
7505
7506
7507
7508
4501
4502
4503
4504
4505
4506
4507
4508
3539
3501
3536
3540
3511
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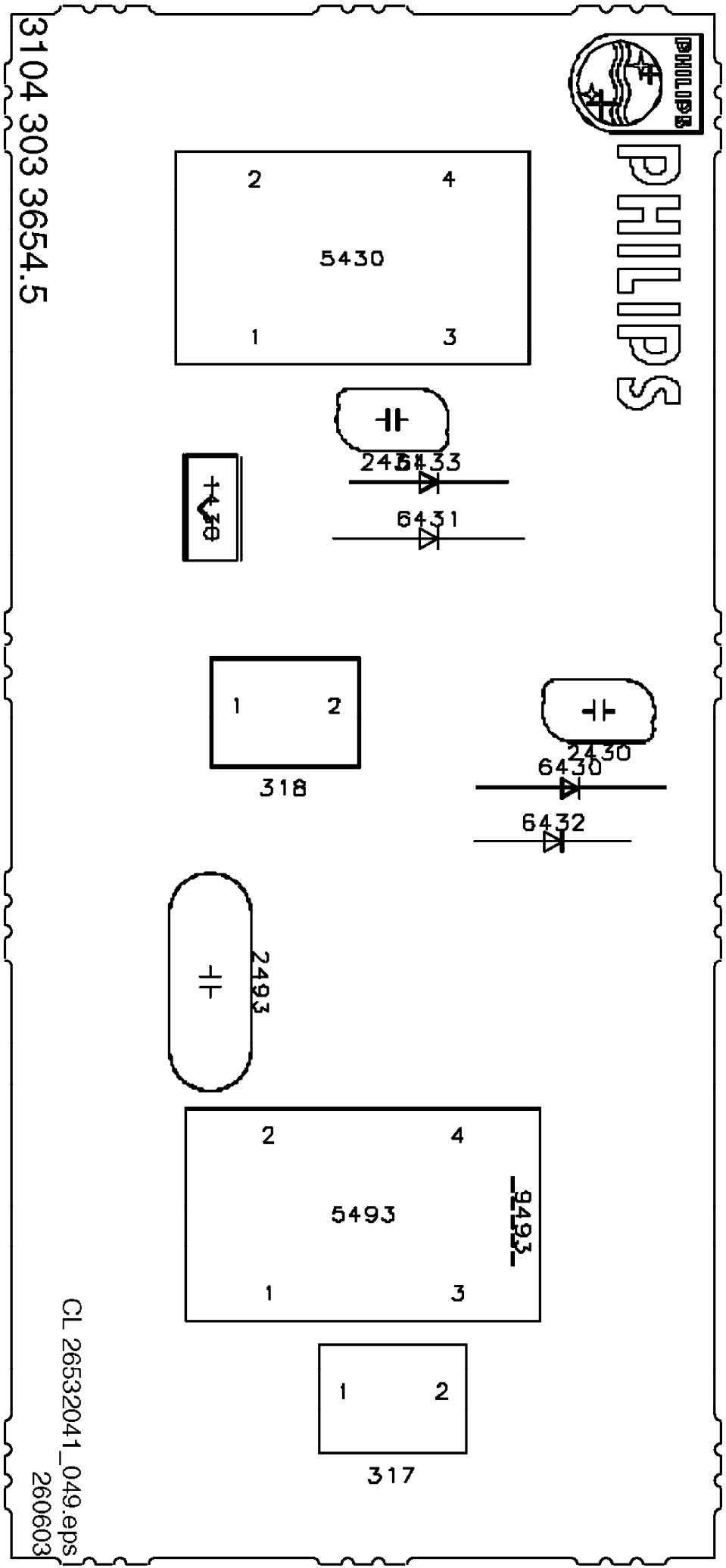
9452
9401


3104 303 3654.5
PHILIPS
2
4
5430
1
3
2433
6431
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2
318
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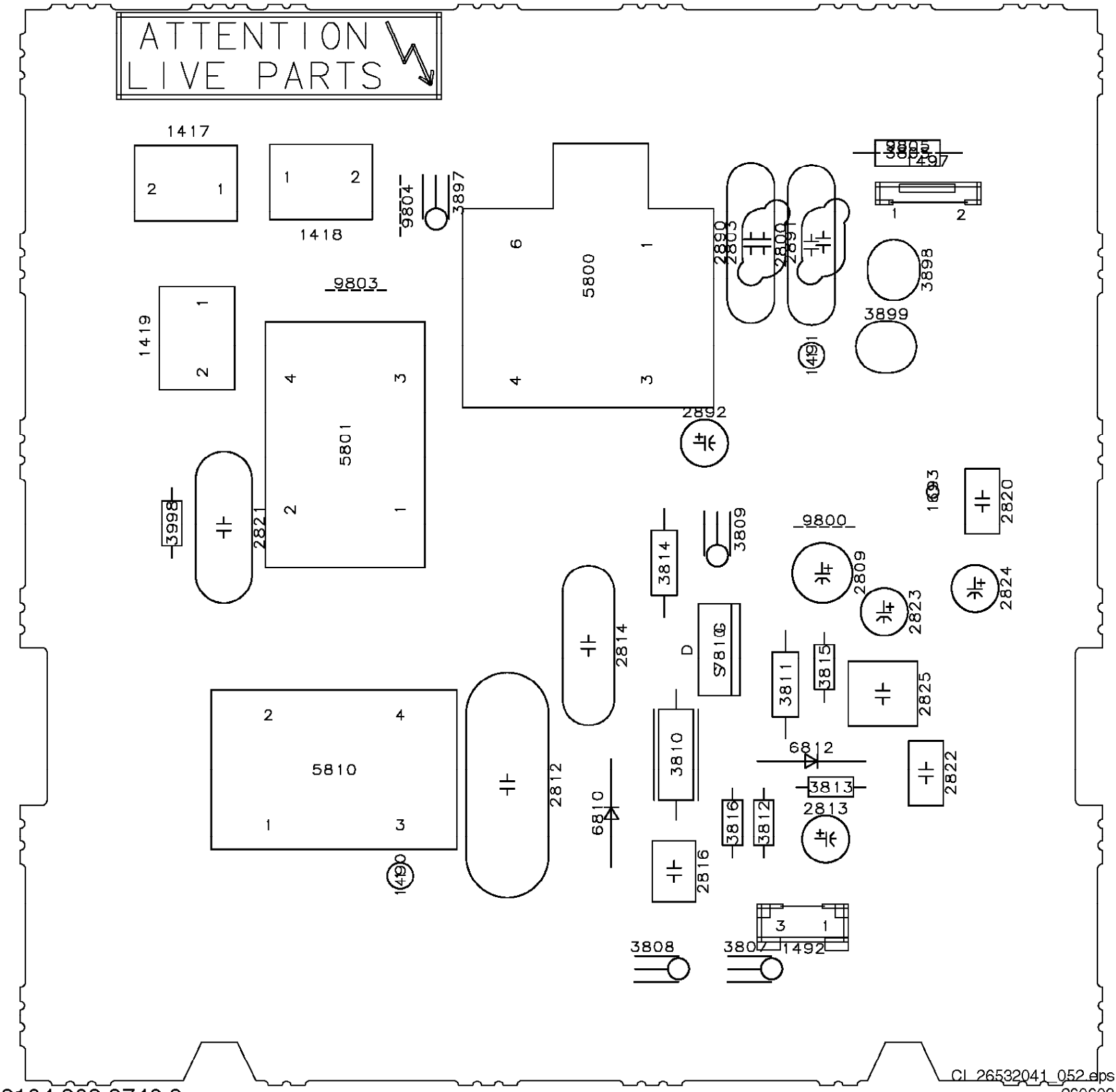
6432
2493
2
4
5493
9493
1
3
1
2
317
CL 26532041_049.eps
260603


ATTENTION
LIVE PARTS
1417
1418
1419
9803
9804
3897
5800
5801
5810
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2803
2891
2800
3898
3899
1491
2892
3998
2821
9800
3809
3814
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2823
2824
2820
2814
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3811
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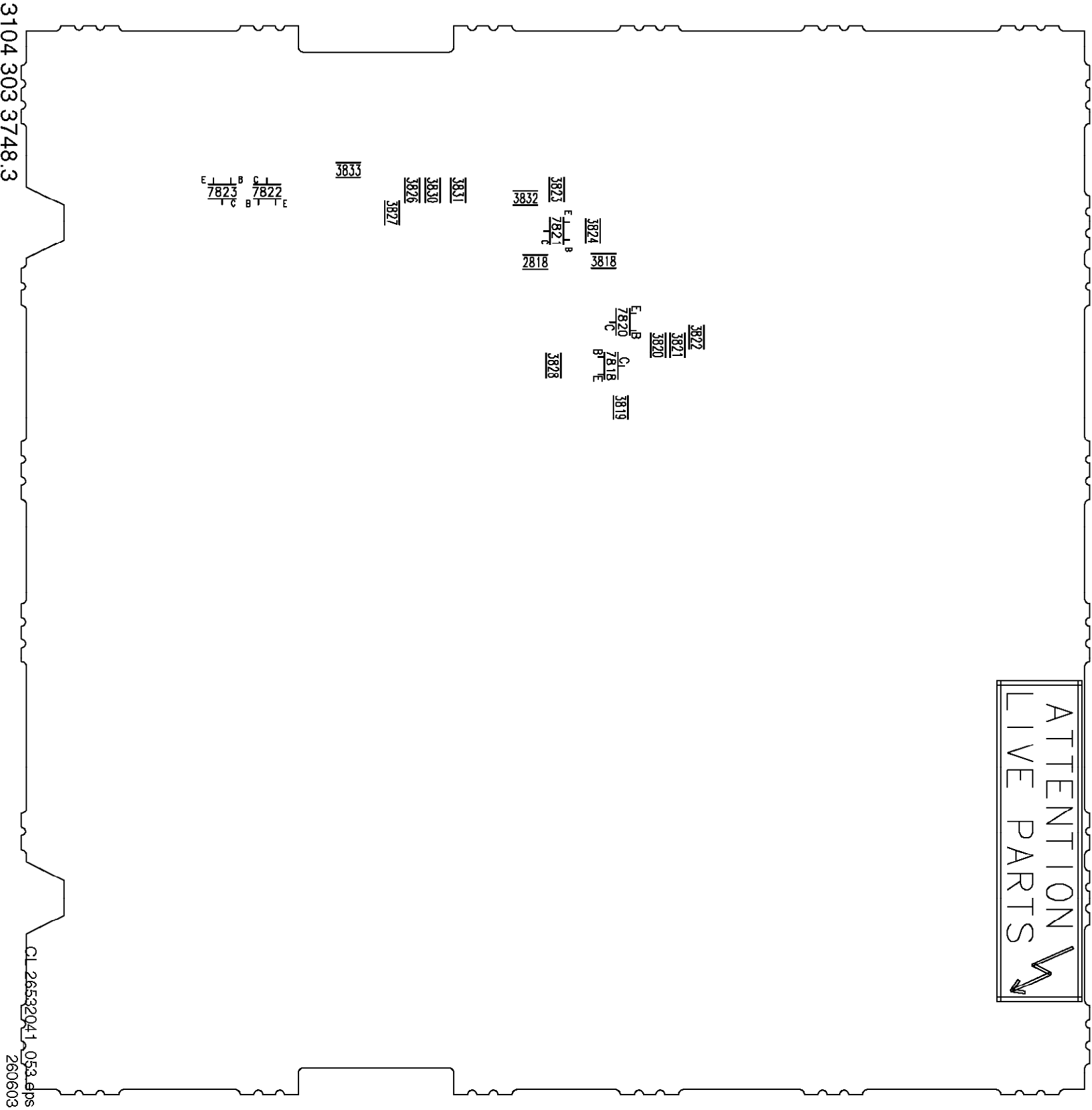
3104 303 3748.3
3833
3831
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3827
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3823
3824
3818
2818
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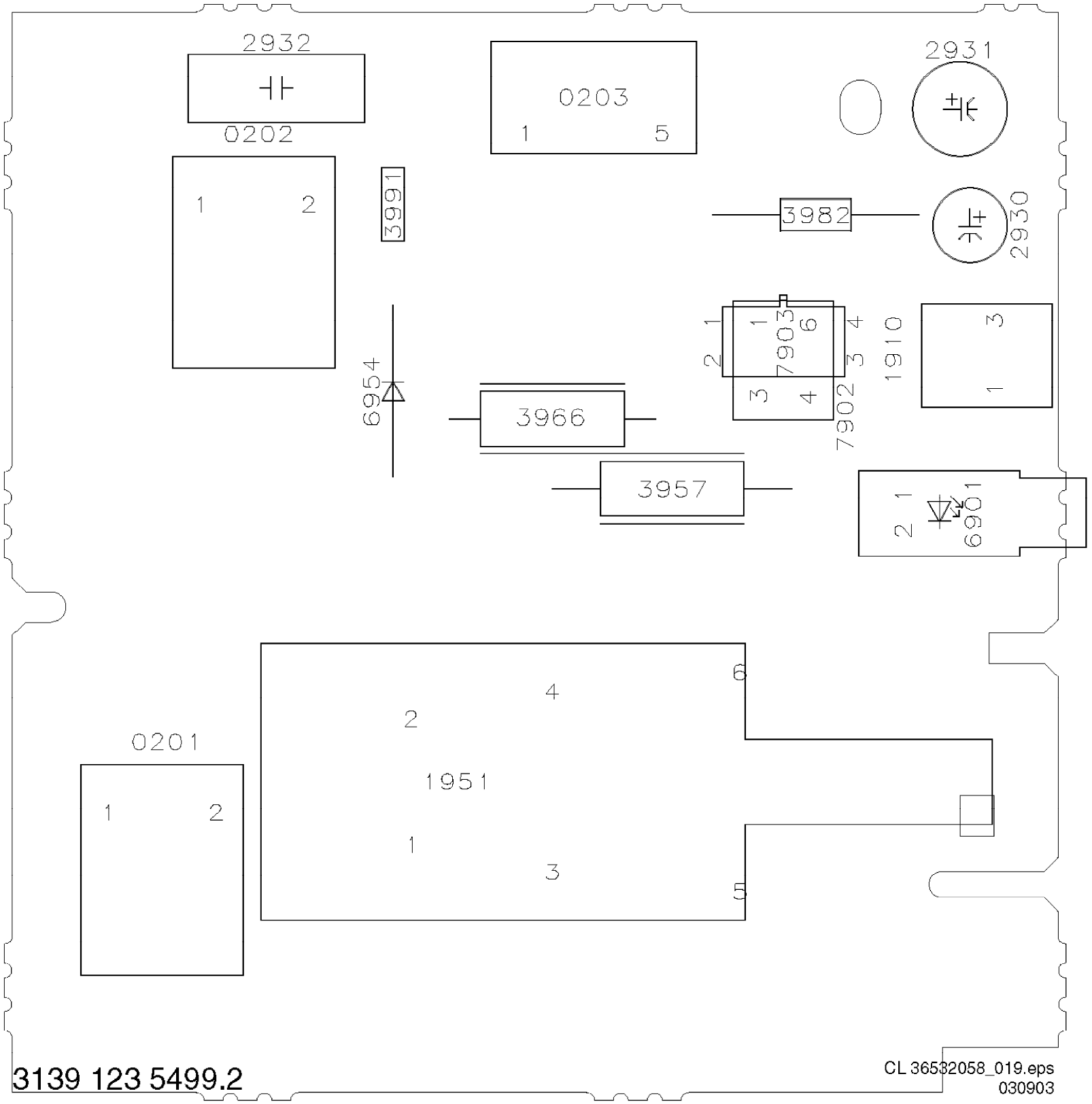
3819
7823
7822
7821
7820
7818
ATTENTION
LIVE PARTS
CL 2653041_053.eps
260603



3139 123 5499.2

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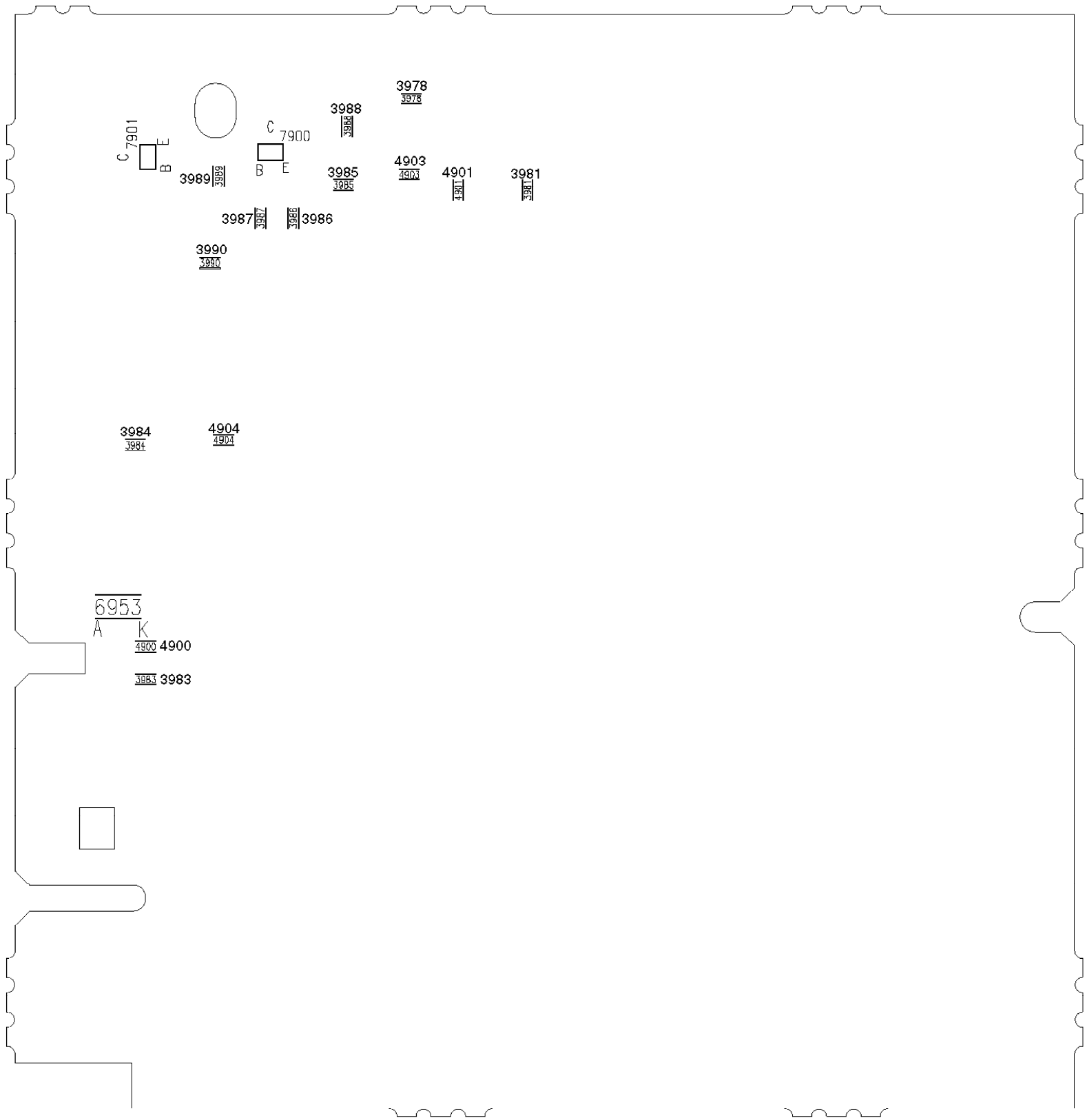
030903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3988
C
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B
E
C
7901
B
E
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4901
4901
3981
3981
3987
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3984
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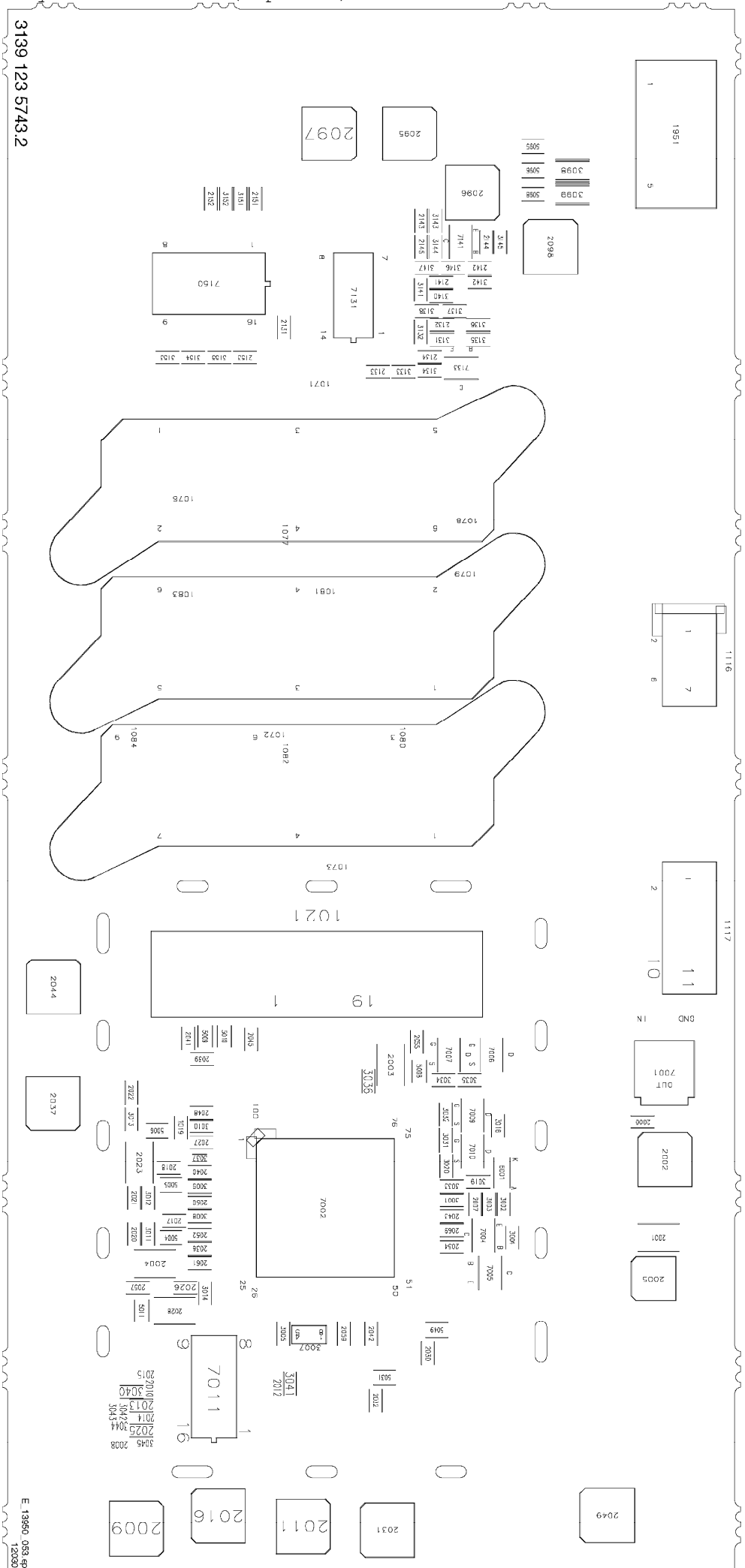
4904
6953
A
K
4900
4900
3983
3983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E_13950_053.eps
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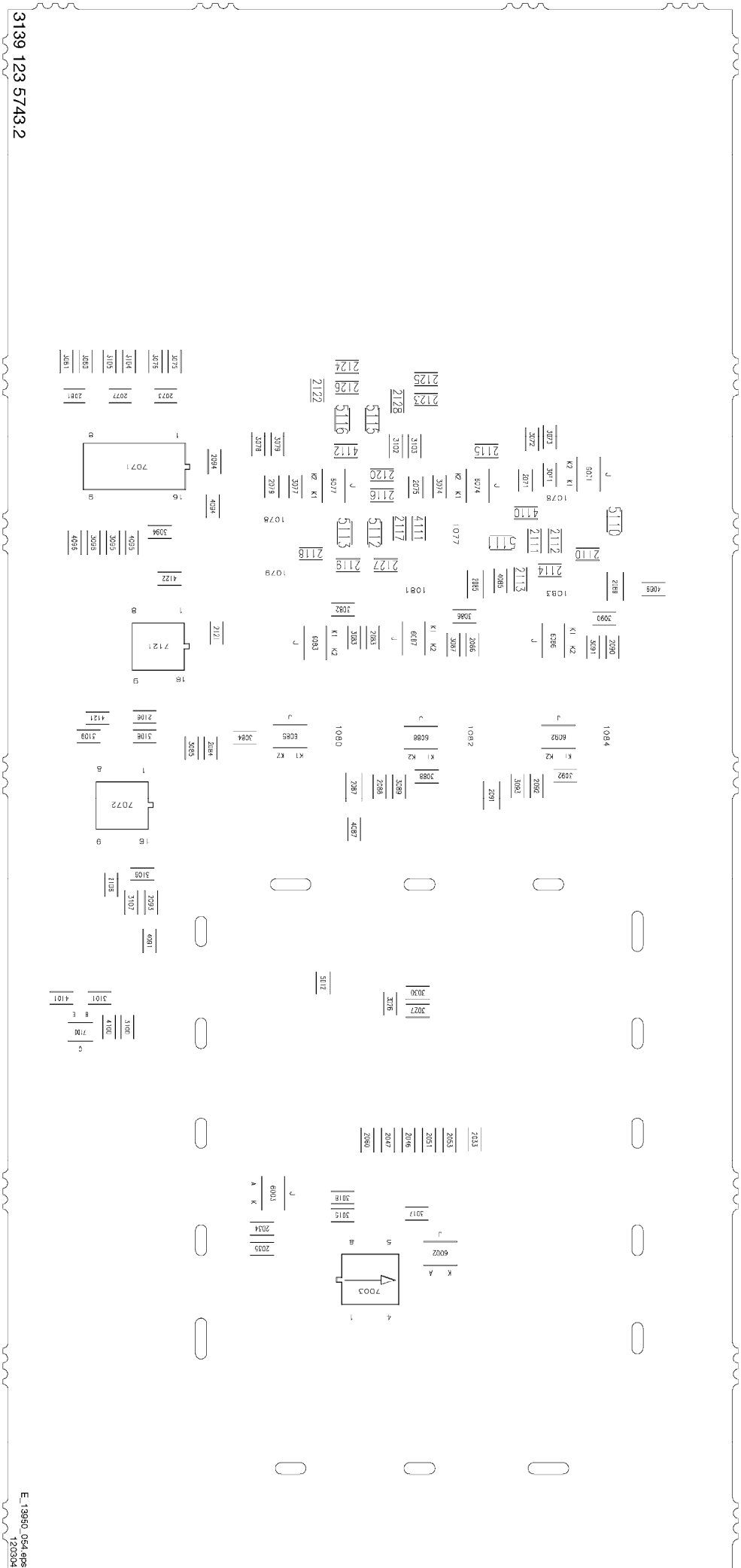
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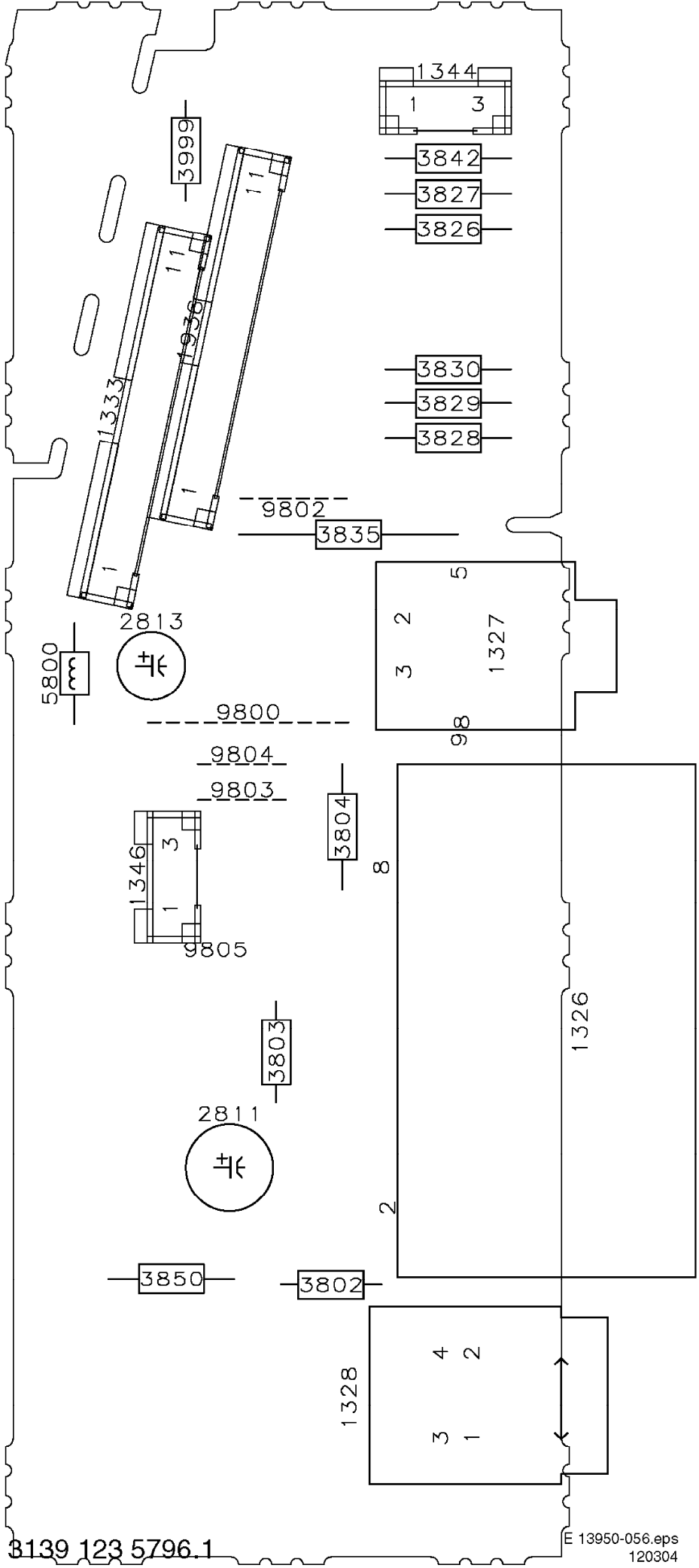

E 13950-056.eps
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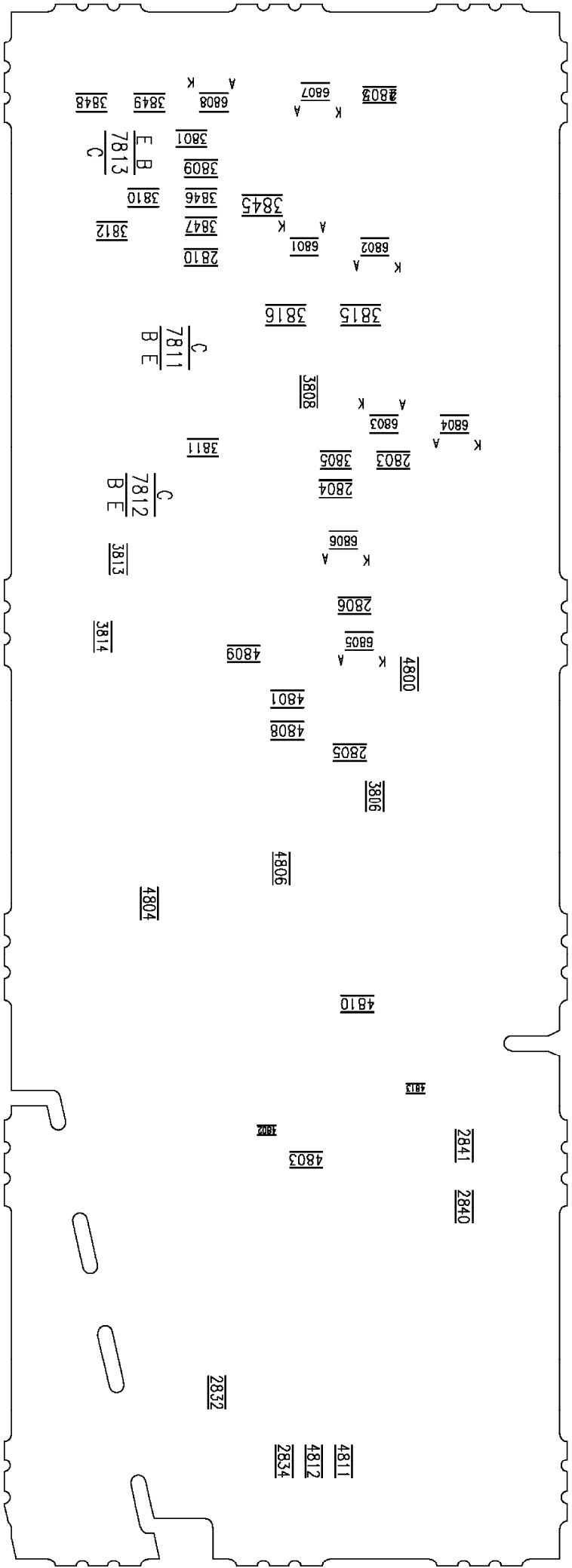
3139 123 5796.1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K
A
6808
A
K
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3848
3801
E B
C
7813
3809
3846
3810
3847
3845
K
A
6801
6802
K
A
2810
3812
3815
3816
C
7811
B E
3808
A
K
6803
6804
K
A
2803
3805
3811
2804
C
7812
B E
6806
K
A
3813
2806
3814
6805
K
A
4809
4800
4801
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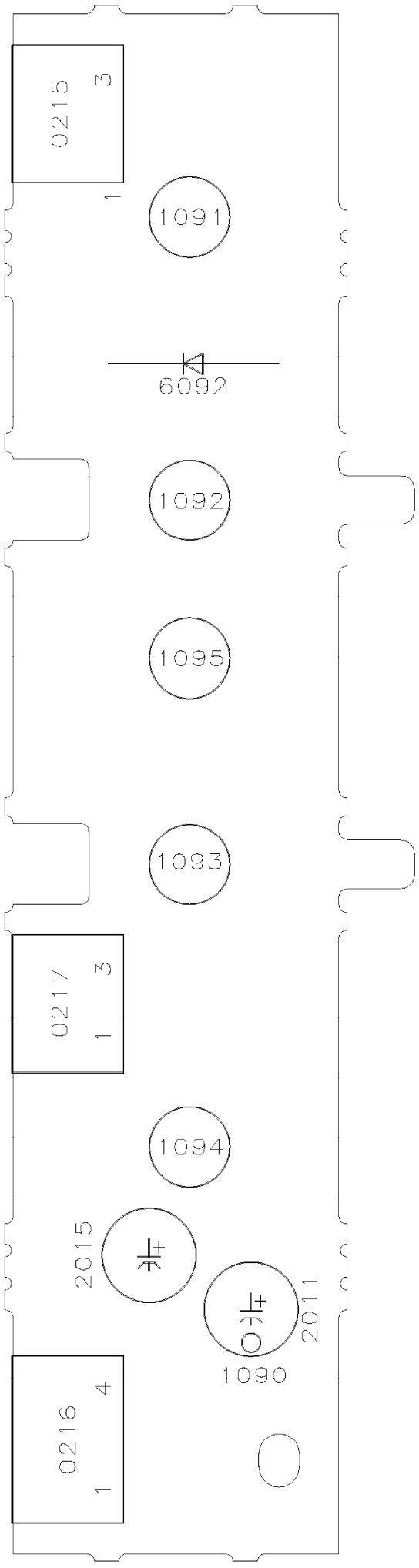
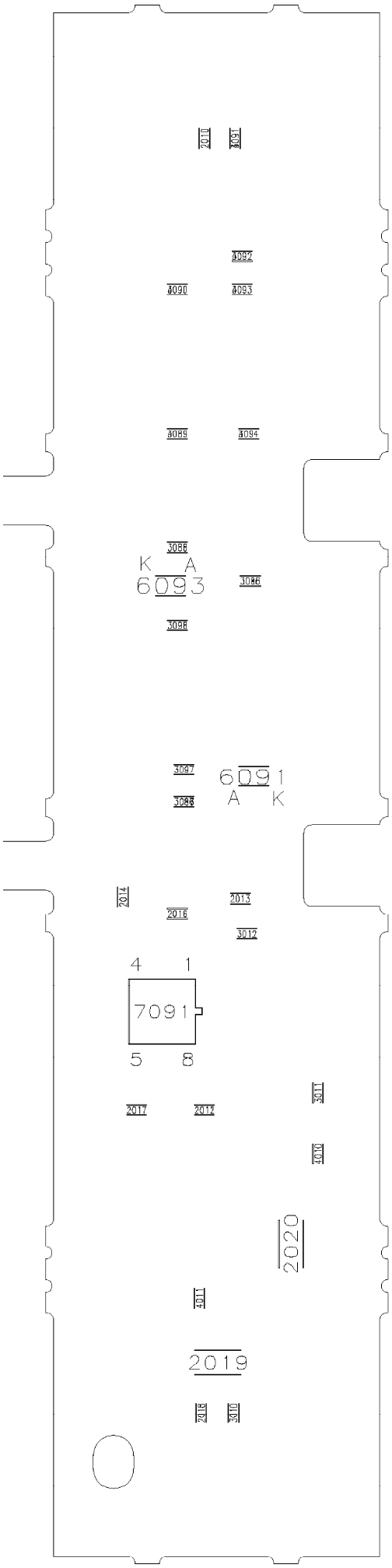


2139 122 5440.5 CL 36532038_030.eps



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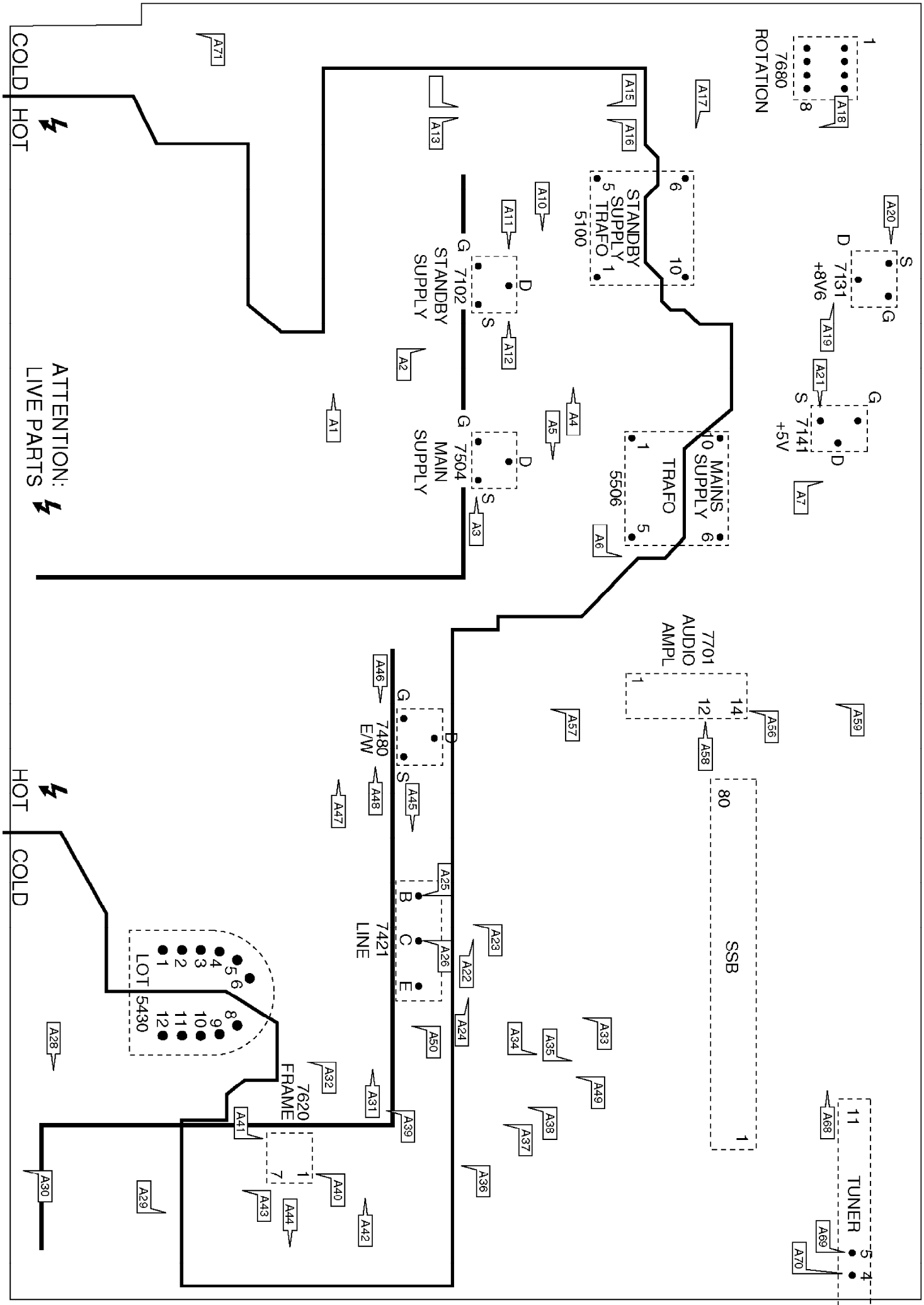
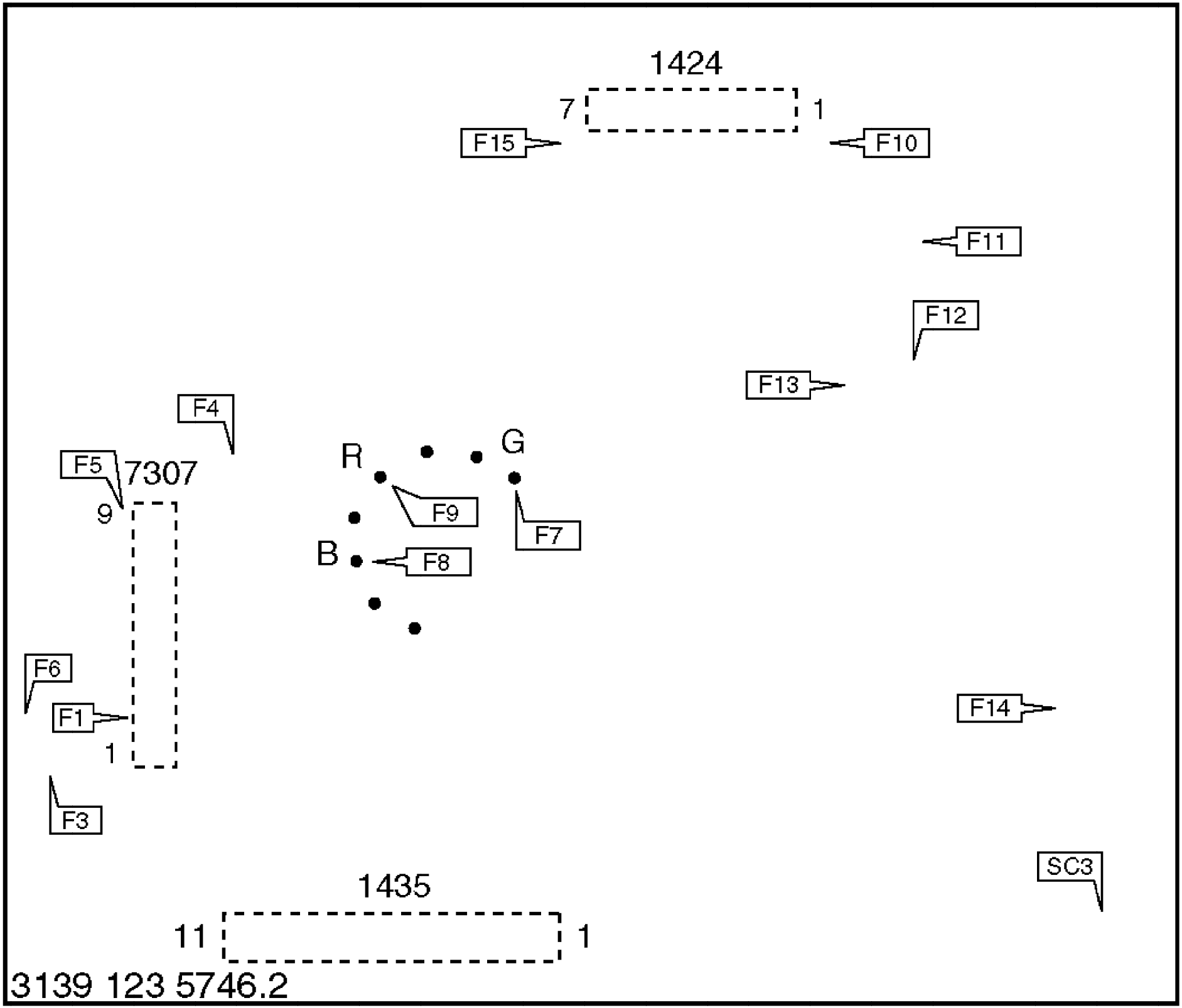

COLD
HOT
ATTENTION:
LIVE PARTS
HOT
COLD
7680
ROTATION
STANDBY
SUPPLY
TRAFO
5100
STANDBY
SUPPLY
7102
MAIN
SUPPLY
7504
MAINS
SUPPLY
TRAFO
5506
7131
+8V6
7141
+5V
7701
AUDIO
AMPL
SSB
TUNER
7480
E/W
7421
LINE
7620
FRAME
LOT
5430


1424
7
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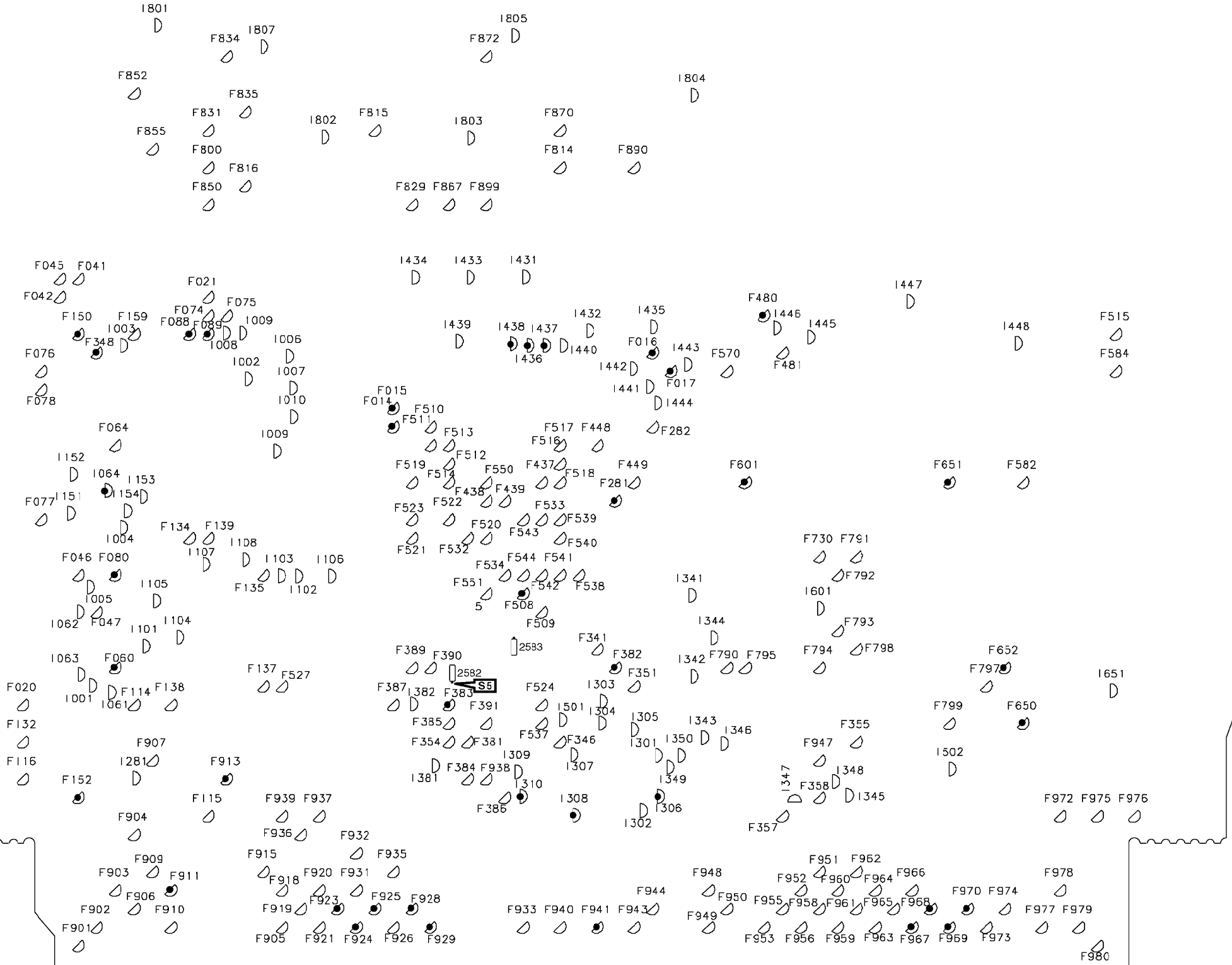
F15
F10
F11
F12
F13
F4
F5
7307
9
R
G
F9
F7
B
F8
F6
F1
1
F3
F14
SC3
1435
11
1
3139 123 5746.2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1807
F834
1805
F872
F852
1804
F835
F831
1802
F815
1803
F870
F855
F800
F814
F890
F816
F850
F829 F867 F899
1434 1433 1431
F045 F041
F042
F021
1447
F480
1446
1445
1432
1435
1439
1438 1437
1448
F515
F150
F159
F088 F089
F075
F074
1009
1003
1006
F348
1008
1440
F016
1443
F570
F584
F076
1002
1007
1436
1442
F481
F017
1441
1444
F078
1010
F015
F014
F510
F511
F064
1009
F513
F517 F448
F282
F516
F512
1152
F519
F514
F550
F437
F518
F449
F601
F651
F582
1064
1153
F438
F439
F281
F077
1151
1154
F522
F533
F523
F134 F139
F520
F543
F539
1004
1108
F521
F532
F540
F730 F791
F046 F080
1107
1103
1106
F534
F544 F541
F792
F551
F542
F538
1341
1601
F135
1102
5
F508
1105
F509
1005
F793
1062
F047
1101
1104
1344
F341
2583
F389
F390
F382
F794
F798
F652
1063
F060
F137
F527
2582
S5
F351
1342
F790 F795
F797
1651
F020
F387
1382
F383
F524
1303
1001
F114
F138
1061
F391
1501
1304
F799
F650
F132
F385
1305
1343
F355
F907
F354
F381
F537
F346
1350
1346
F947
1309
1301
1502
F116
1281
F913
F384 F938
1307
1348
1381
1349
1347
F358
1345
F152
1310
F386
1308
1306
F357
F972 F975 F976
F115
F939 F937
1302
F904
F936
F932
F915
F935
F951 F962
F909
F948
F952
F960
F964
F966
F978
F903
F911
F920 F931
F944
F950
F955
F958
F961
F965
F968
F970 F974
F906
F918
F923
F925
F928
F933 F940 F941 F943
F949
F977 F979
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F919
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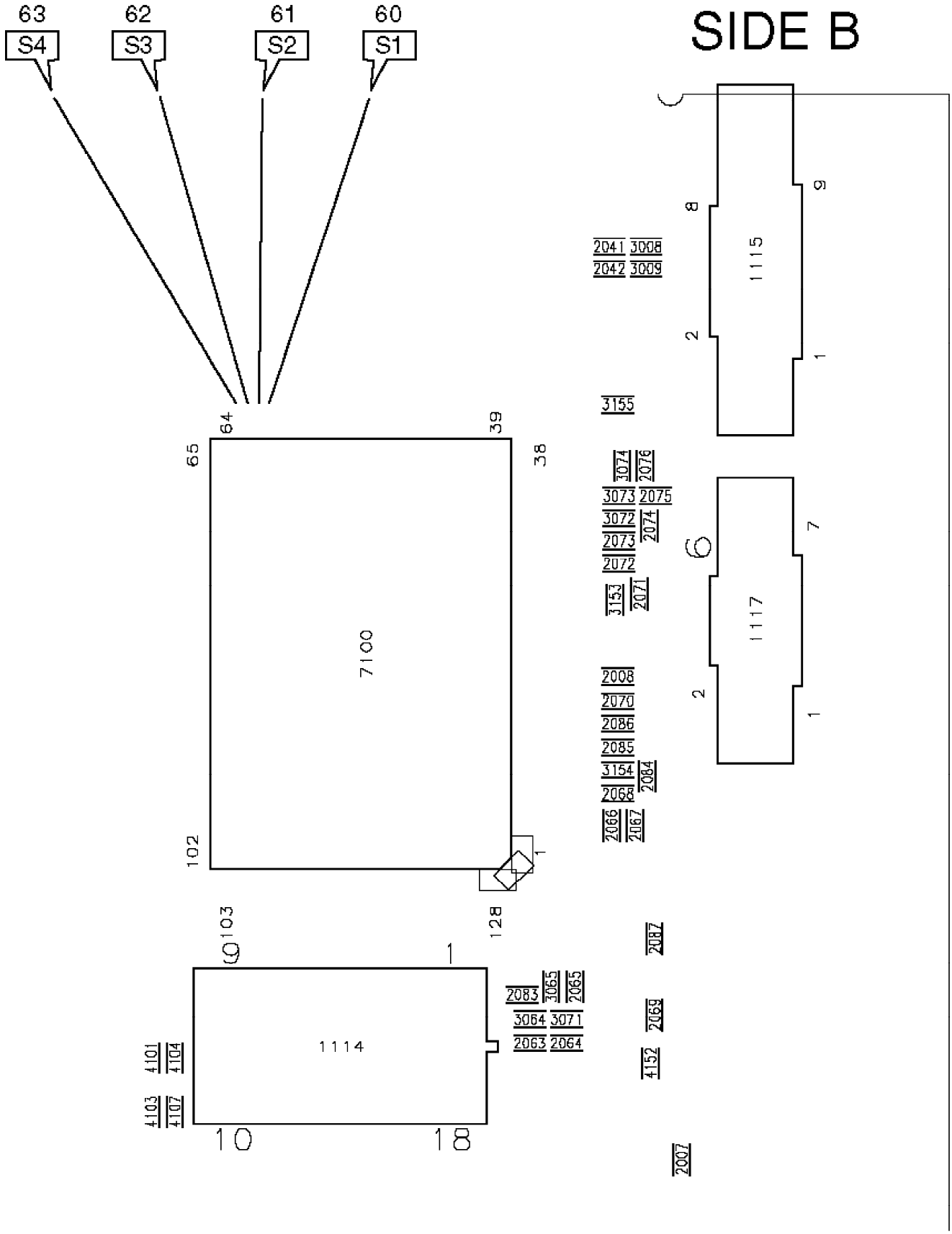
F926
F929
F980


63
S4
62
S3
61
S2
60
S1
SIDE B
64
39
65
38
7100
102
1
128
103
1
1114
10
18
1115
1117
2041
3008
2042
3009
3155
3074
2076
3073
2075
3072
2074
2073
2072
3153
2071
2008
2070
2086
2085
3154
2084
2068
2066
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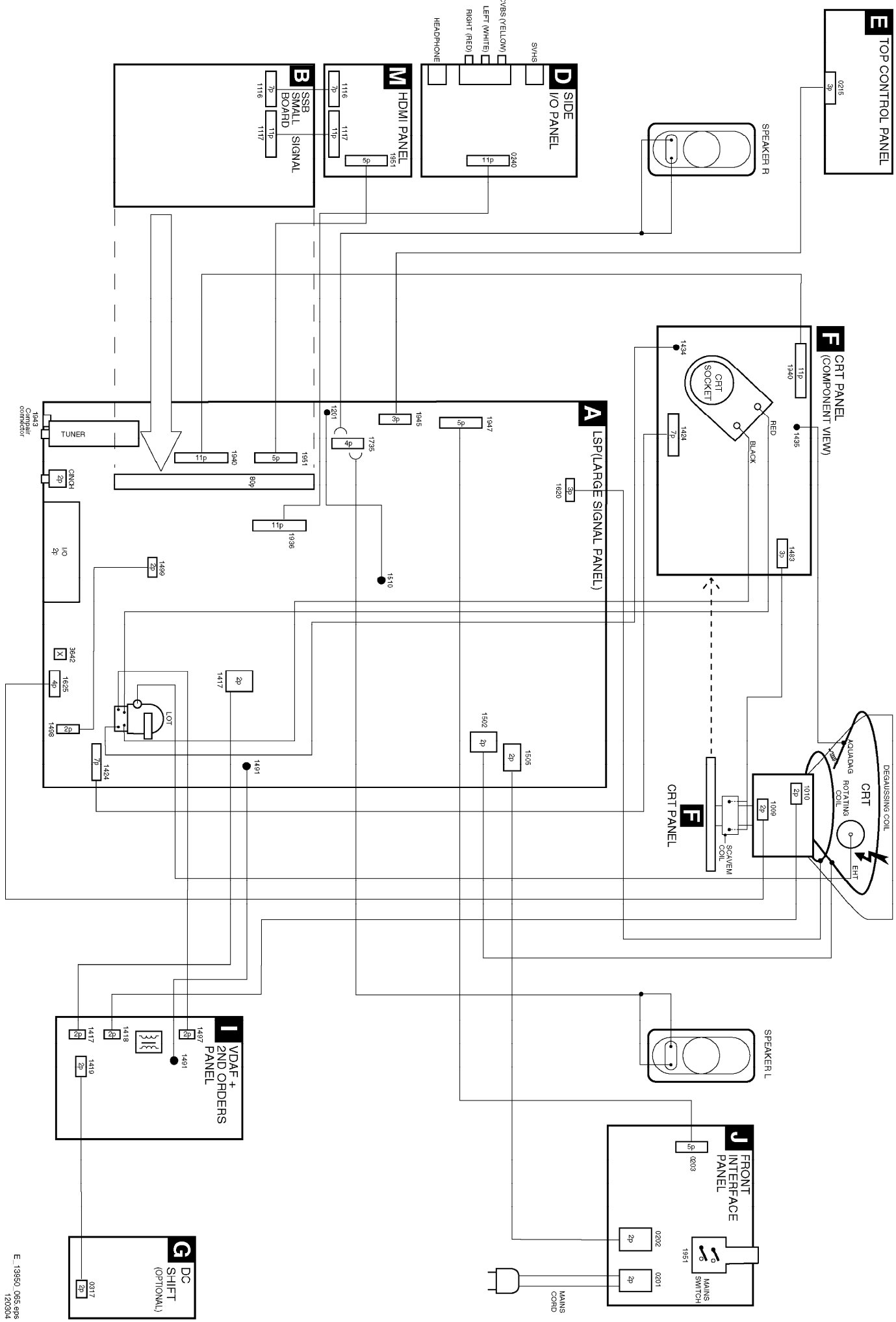
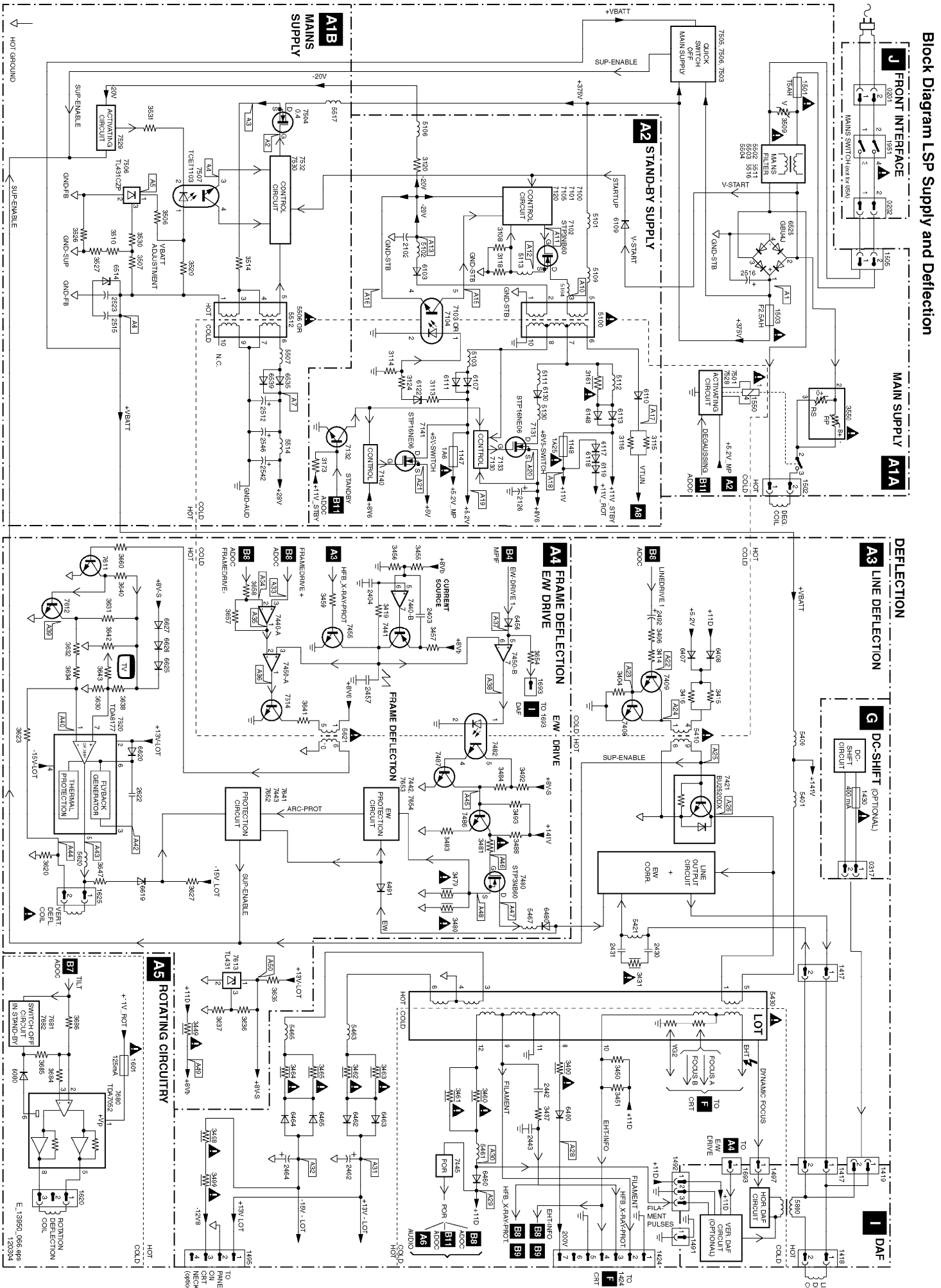
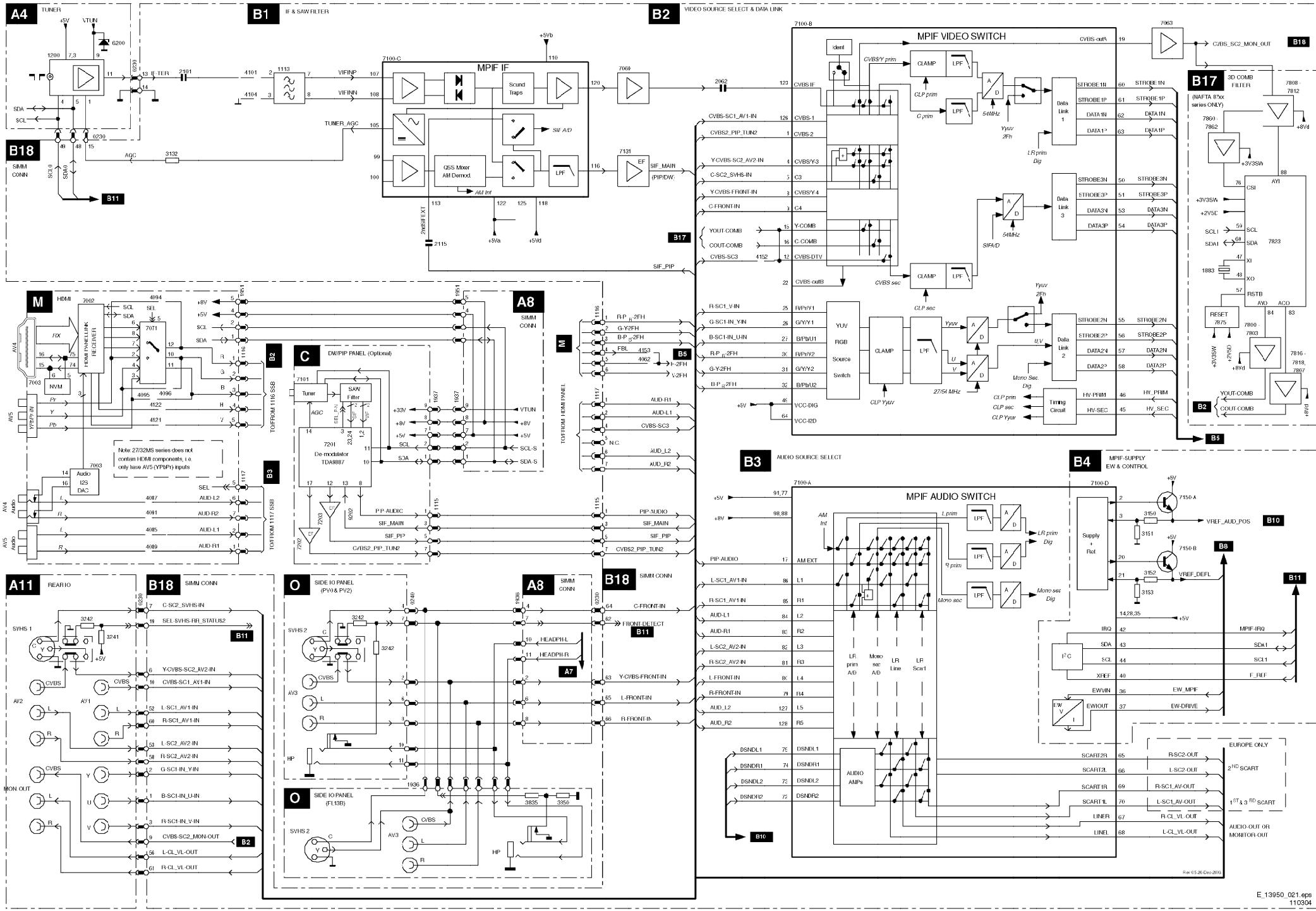
4104
4103
4107
4152
2007

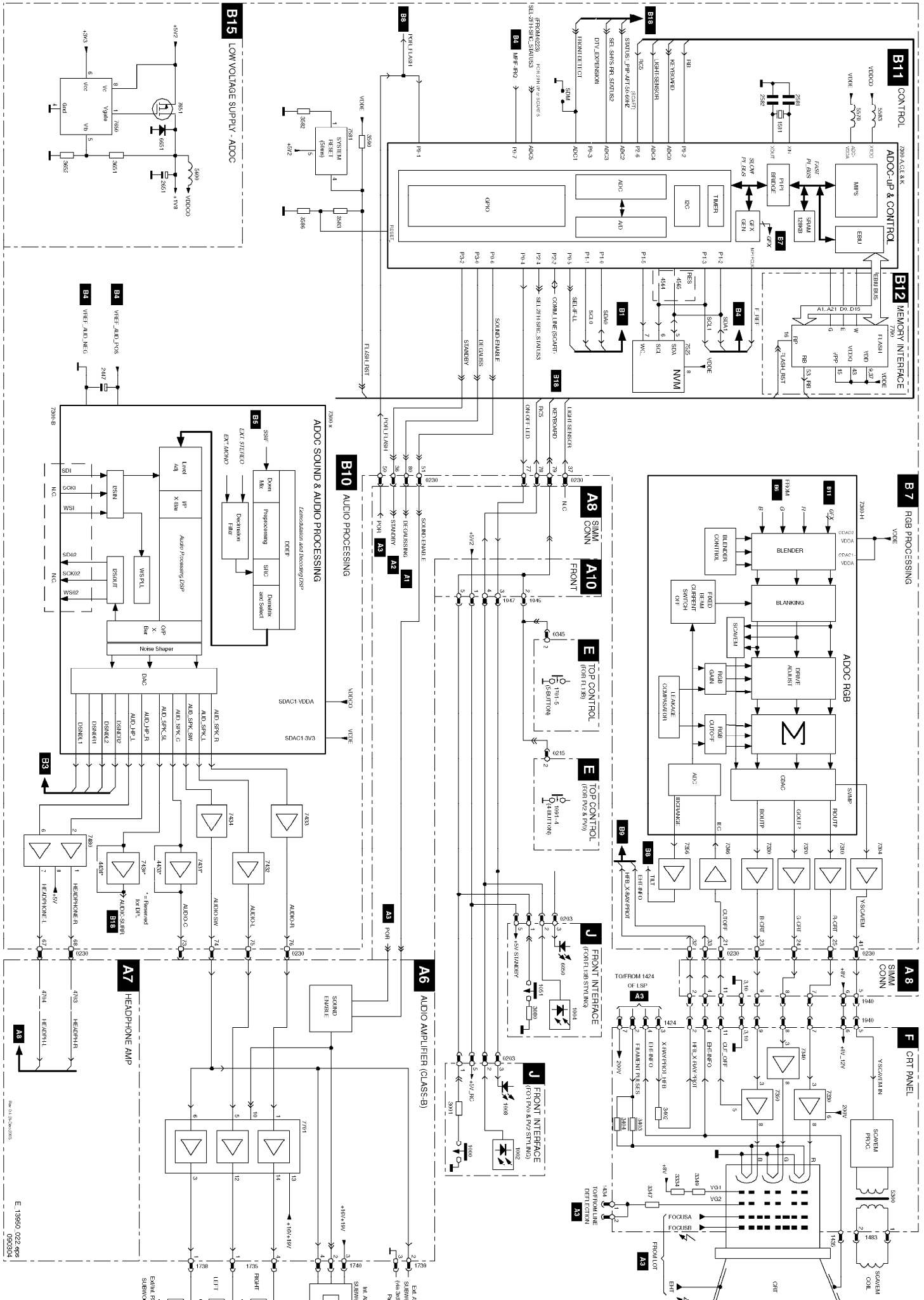

Wiring Diagram
E TOP CONTROL PANEL
0215
3p
SPEAKER R
HEADPHONE
CVBS (YELLOW)
LEFT (WHITE)
RIGHT (RED)
SVHS
D SIDE I/O PANEL
0240
11p
M HDMI PANEL
1951
5p
B SSB SMALL SIGNAL BOARD
1116
1117
7p
11p
F CRT PANEL (COMPONENT VIEW)
1434
CRT SOCKET
RED
BLACK
1424
7p
1435
1483
3p
11p
1940
A LSP(LARGE SIGNAL PANEL)
1620
1945
1947
1735
1510
1936
1499
1642
1625
1498
1417
1502
1505
1491
F CRT PANEL
SCAVEM COIL
1009
1010
DEGAUSSING COIL
AQUADAG
CRT
ROTATING COIL
EHT
1943 Compair connector
TUNER
CINCH
I/O
80p
I VDAF + 2ND ORDERS PANEL
1497
1418
1419
G DC SHIFT (OPTIONAL)
0317
SPEAKER L
J FRONT INTERFACE PANEL
0203
0202
0201
MAINS SWITCH
MAINS CORD
E_13950_065.eps
120304


Block Diagram LSP Supply and Deflection
MAIN SUPPLY
A1A
A1B MAINS SUPPLY
A2 STAND-BY SUPPLY
DEFLECTION
A3 LINE DEFLECTION
A4 FRAME DEFLECTION
E/W DRIVE
A5 ROTATING CIRCUITRY
G DC-SHIFT (OPTIONAL)
I DAF
J FRONT INTERFACE
+VBATT
SUP-ENABLE
-20V
+375V
+141V
+28V
+13V-LOT
-15V-LOT
+11V_ROT
+11V_STBY
+8V6
+5.2V_MP
+5V
+8V-S
+8Vb
HOT GROUND
GND-FB
GND-SUP
GND-STB
GND-AUD
V-START
STARTUP
STANDBY
CONTROL
VTUN
DEGAUSSING
MAINS SWITCH (not for USA)
QUICK SWITCH OFF MAIN SUPPLY
ACTIVATING CIRCUIT
CONTROL CIRCUIT
SWITCH OFF CIRCUIT IN STAND-BY
VBATT ADJUSTMENT
DEG. COIL
HOT
COLD
N.C.
LINEDRIVE1
EW-DRIVE
HFB_X-RAY-PROT
FRAMEDRIVE+
FRAMEDRIVE-
CURRENT SOURCE
DAF
TO 1693
DC-SHIFT CIRCUIT
LINE OUTPUT CIRCUIT
EW CORR.
BU2520DX
LOT
DYNAMIC FOCUS
FOCUS_A
FOCUS_B
VG2
EHT
FILAMENT
EHT-INFO
HOR.DAF CIRCUIT
VER. DAF CIRCUIT (OPTIONAL)
LINE DEFLECTION COIL
VERT. DEFL. COIL
ROTATION DEFLECTION COIL
TO CRT
TO 1624
TO PANEL ON CRT NECK (optional)
THERMAL PROTECTION
FLYBACK GENERATOR
PROTECTION CIRCUIT
EW PROTECTION CIRCUIT
ARC-PROT
TDA8177
TDA7052
TL431
TCE1110S
STP16NE06
STP3NB60
STP7NB80
TV
E_13950_066.eps 120304

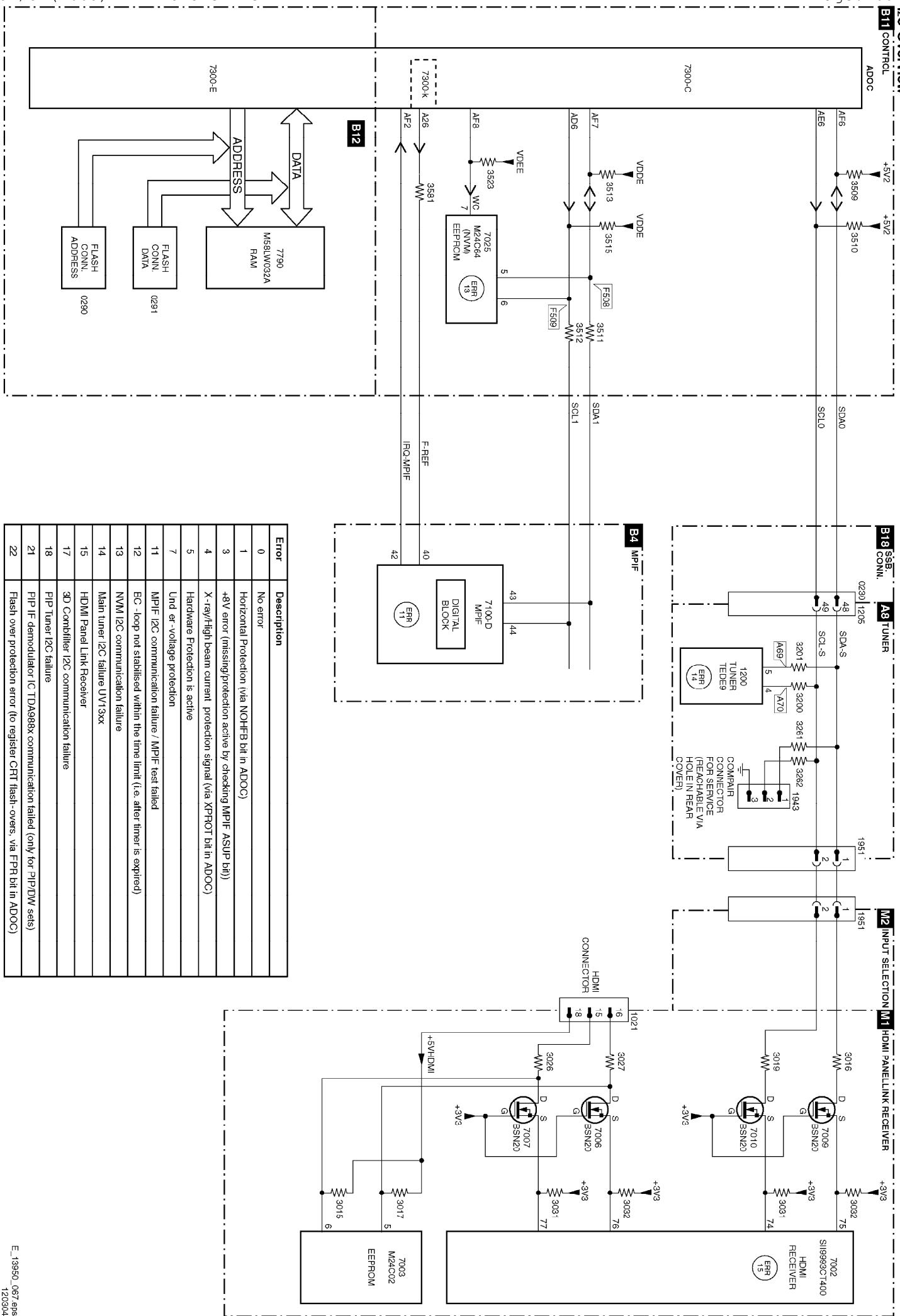
Block Diagram 1 Audio & Video (A02 NAFTA IF_video_source_ select)


A4 TUNER
B1 IF & SAW FILTER
B2 VIDEO SOURCE SELECT & DATA LINK
MPIF IF
MPIF VIDEO SWITCH
B18 SIMM CONN
B17 3D COMB FILTER
(NAFTA 87xx series ONLY)
M HDMI
HDMI PANEL LINK RECEIVER
A8 SIMM CONN
C DVI/PIP PANEL (Optional)
B3 AUDIO SOURCE SELECT
MPIF AUDIO SWITCH
B4 MPIF-SUPPLY EW & CONTROL
A11 REAR IO
O SIDE IO PANEL (PV0 & PV2)
O SIDE IO PANEL (FL13B)
EUROPE ONLY
AUDIO-OUT OR MONITOR-OUT
Note: 27/32MS series does not contain HDMI components, i.e. only have AV5 (YPbPr) inputs
E_13950_021.eps
110304

Block Diagram 2 Audio & Video (A02 NAFTA Video Audio class-B Output)

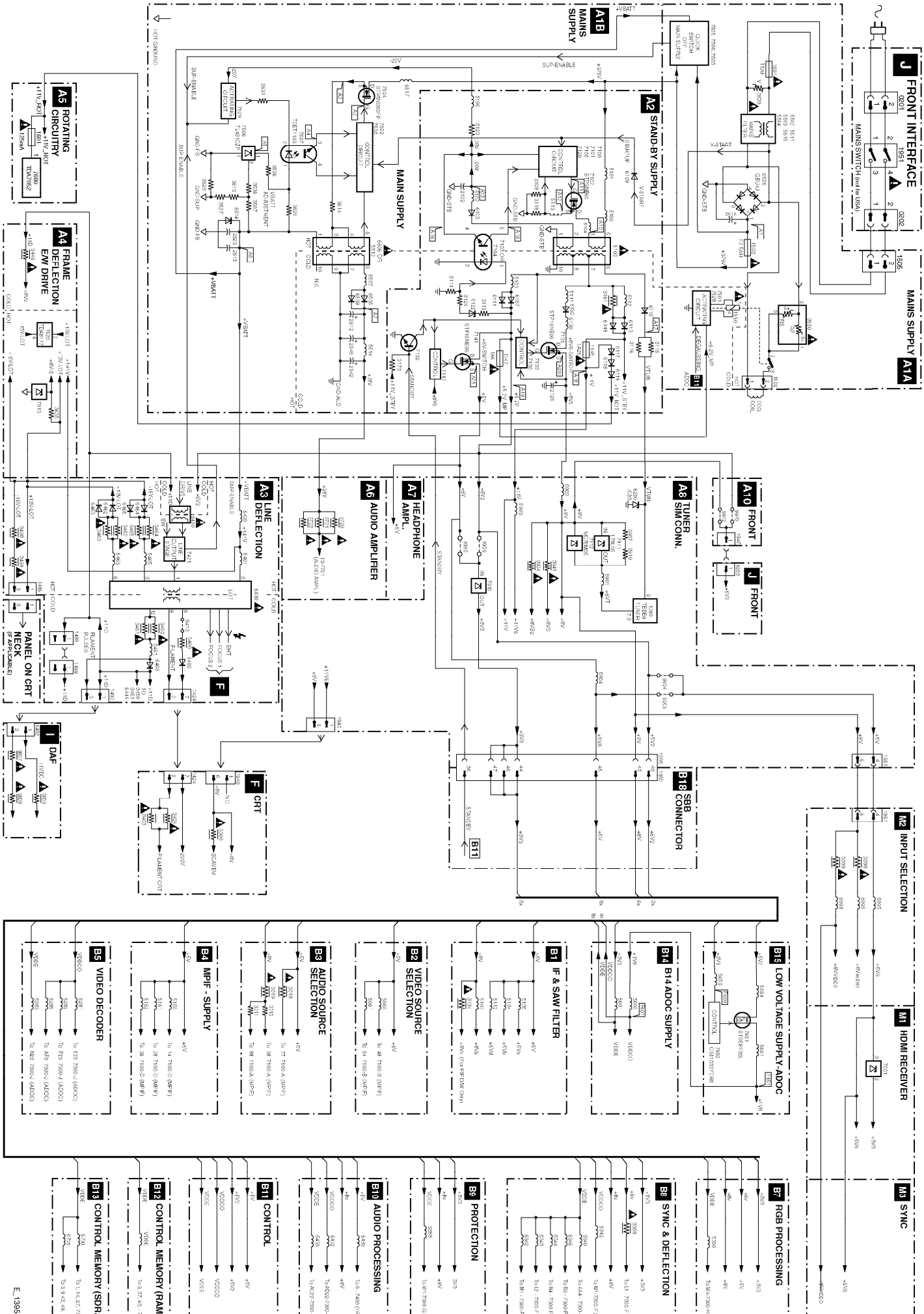


I2C Overview



Error	Description
0	No error
1	Horizontal Protection (via NOHFB bit in ADOC)
3	+8V error (missing/protection active by checking MPIF ASUP bit))
4	X-ray/High beam current protection signal (via XPROT bit in ADOC)
5	Hardware Protection is active
7	Und er-voltage protection
11	MPIF I2C communication failure / MPIF test failed
12	EC -loop not stabilised within the time limit (i.e. after timer is expired)
13	NVM I2C communication failure
14	Main tuner I2C failure UV13xx
15	HDMI Panel Link Receiver
17	3D Combfilter I2C communication failure
18	PIP Tuner I2C failure
21	PIP IF demodulator IC TDA988x communication failed (only for PIP/DW sets)
22	Flash over protection error (to register CRT flash -overs, via FPR bit in ADOC)

Supply Lines Overview



Mechanical Instructions

Index of this chapter:

1. Service connector
2. Set Disassembly
3. Service Positions
4. Assies / Panels Removal
5. Set Reassembly

Note: figures below can deviate slightly from the actual situation, due to the different set executions.

Service Connector (for ComPair)

For service diagnostics with ComPair, it is not necessary to disassemble the set. You only have to connect the ComPair interface box via the appropriate cable, to the service connector on the rear of the set (see figure 'Rear connections' in chapter 'Technical specifications, ...'), and start the program (see also chapter 'Service Modes .... ').

Set Disassembly

Follow the disassemble instructions in described order.

Rear Cover Removal

Warning: disconnect the mains power cord before you remove the rear cover.

For PV2 styling (for 8402 and 8302 sets)

1. Manually unlock and remove the two plastic cover cups (1) (if present) on the top of TV.
2. Remove all the fixation screws of the rear cover.
3. Remove the rear cover.

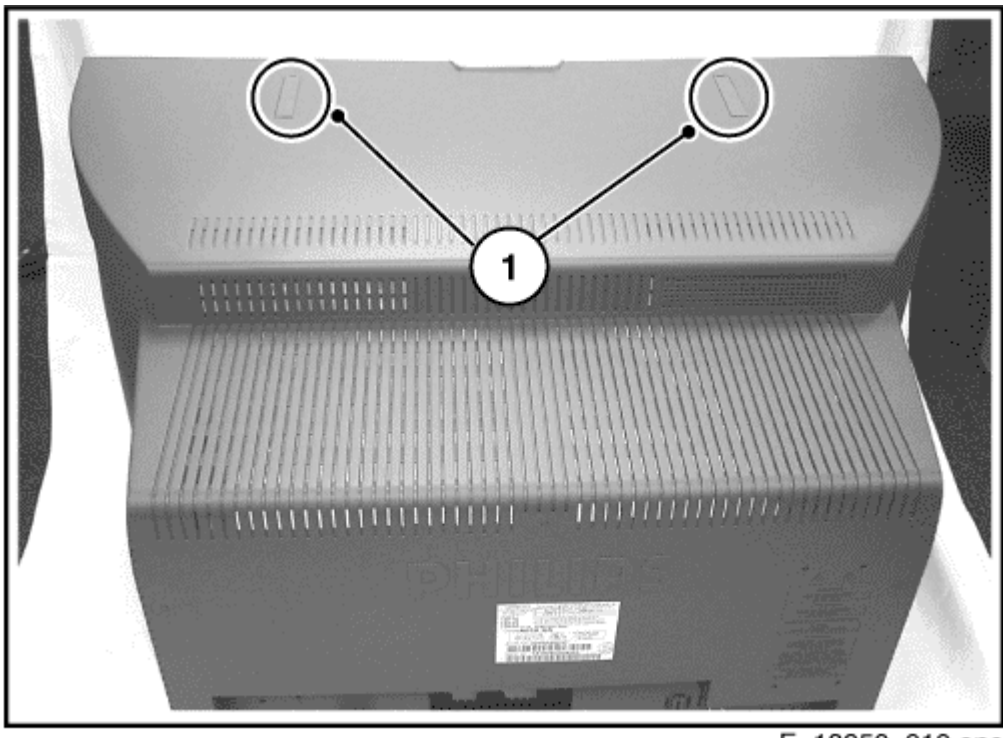


Figure: Rear cover (for PV2 styling)

For FL13 styling (for 8502 sets)

1. Remove all screws. If you do not remove them, you cannot access the clips.
2. Tilt the set a little forward, so that you can release the two clickfit clamps that are located at the bottomplate of the set.
3. Four openings (1) can be found at the top. The openings are very small (2). **Note:** Some sets only have the two inner openings.
4. Underneath every opening there is a clip. Push this clip down with a very thin piece of metal (3), until you hear a click. **Caution** : do **not** use a screwdriver, this will damage the cabinet.
5. When all four clips are pushed down, the back cover can be removed.

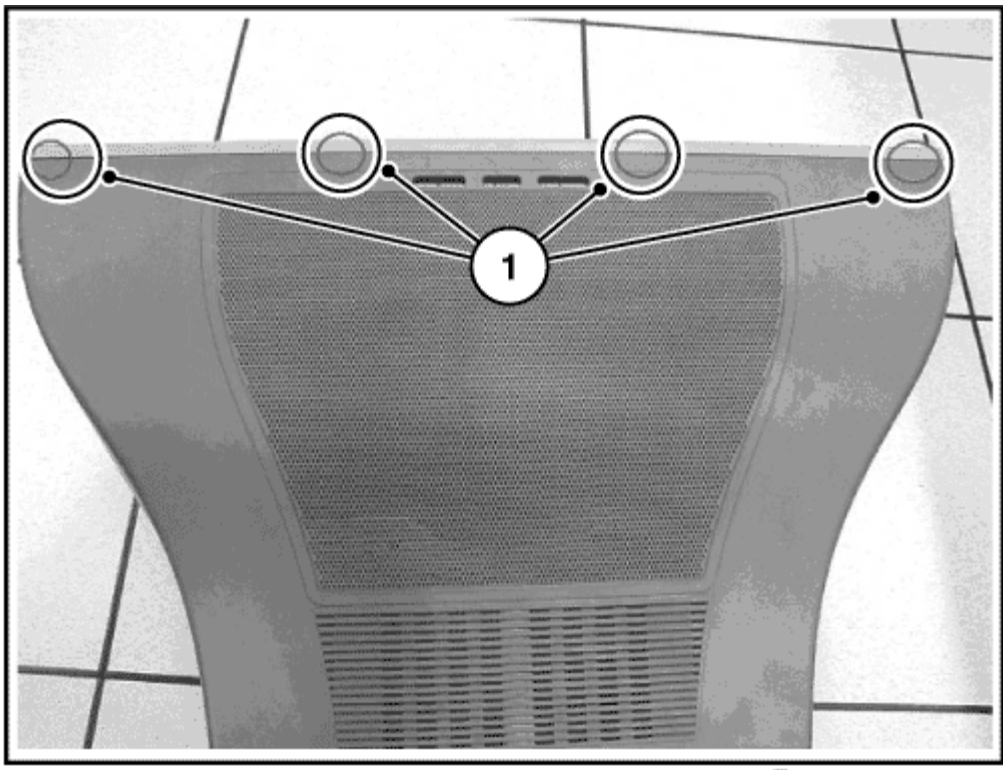


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Figure: Rear cover (for FL13 styling)

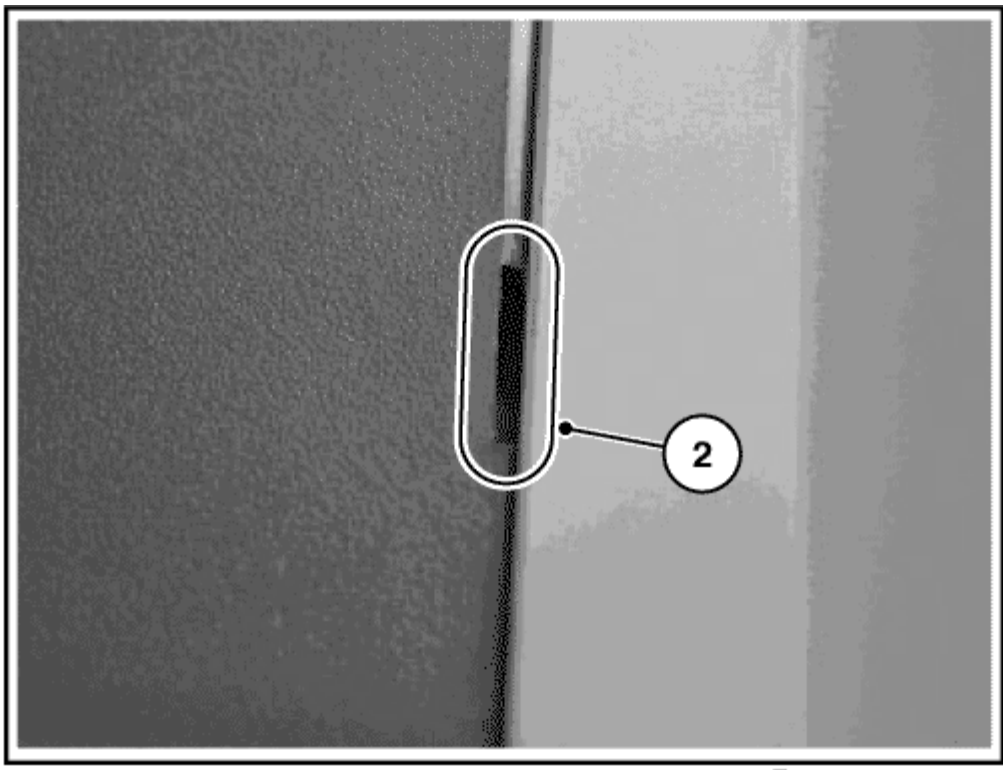

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Figure: Opening

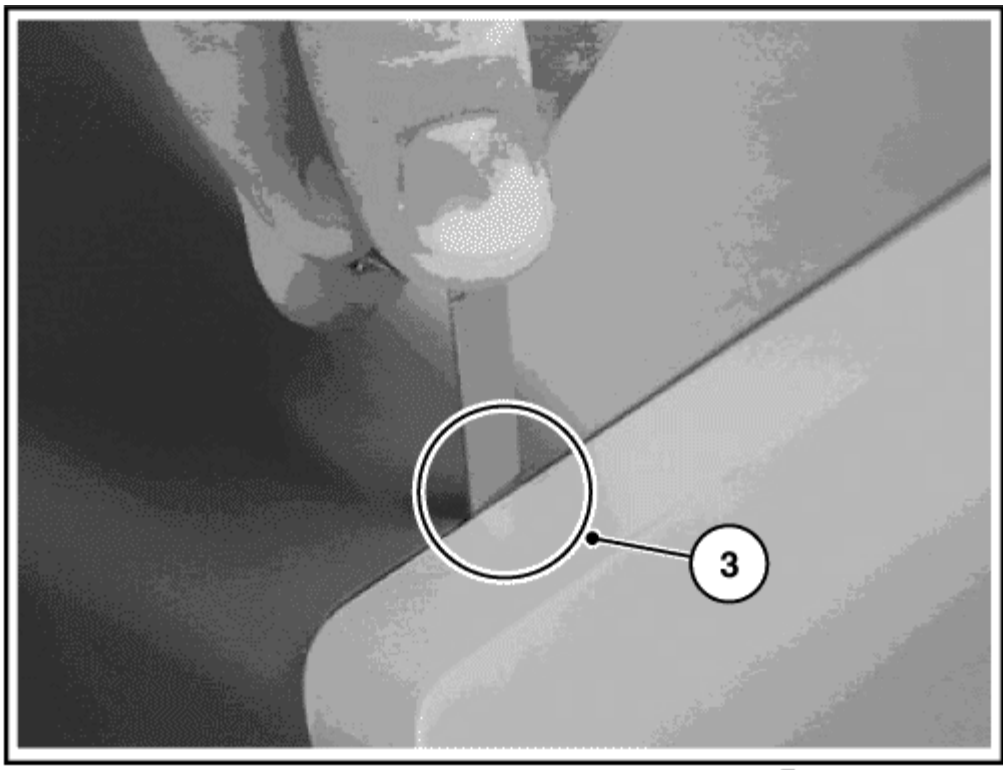

Figure: Pushing clips down

Service Positions

This chassis has several predefined service positions, for better accessibility. They are explained below in more detail.

Large Signal Panel (LSP)

Service position 1 - Component Side of the LSP

For better accessibility of the LSP, do the following (see Figure 'Service position 1'):

1. Remove the LSP-bracket from the bottom tray by pulling it backwards.
2. Hook the bracket in the first row of fixation holes of the bottom tray. In other words, reposition the bracket from (1) to (2).

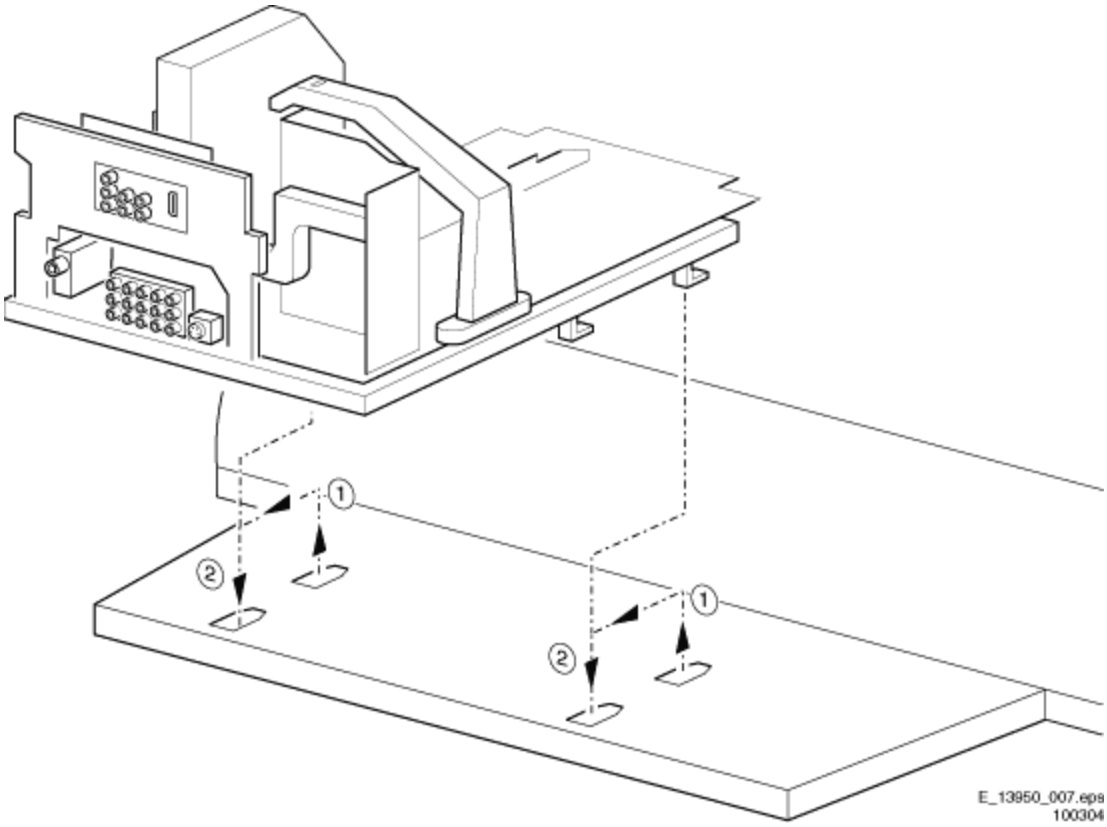

Figure: Service position 1

Service position 2 - Solder Side of the LSP

To get access to the bottom side (solder side) of the LSP, do the following (see figure above):

1. Remove the DC-Shift assy (1) (see paragraph 'DC-Shift Assy/Panel' below).
2. Release the Front interface assy from the bottom plate (2) (see paragraph 'Top Control Assy/Panel' below).
3. Disconnect the degaussing coil from the LSP. Therefore remove the cable from the connector 1502 .
4. Release some wiring from their fixation clamps, in order to get room for repositioning the LSP.
5. Flip the LSP 90 degrees clockwise (3), and place it vertically on the bottom plate and a table.

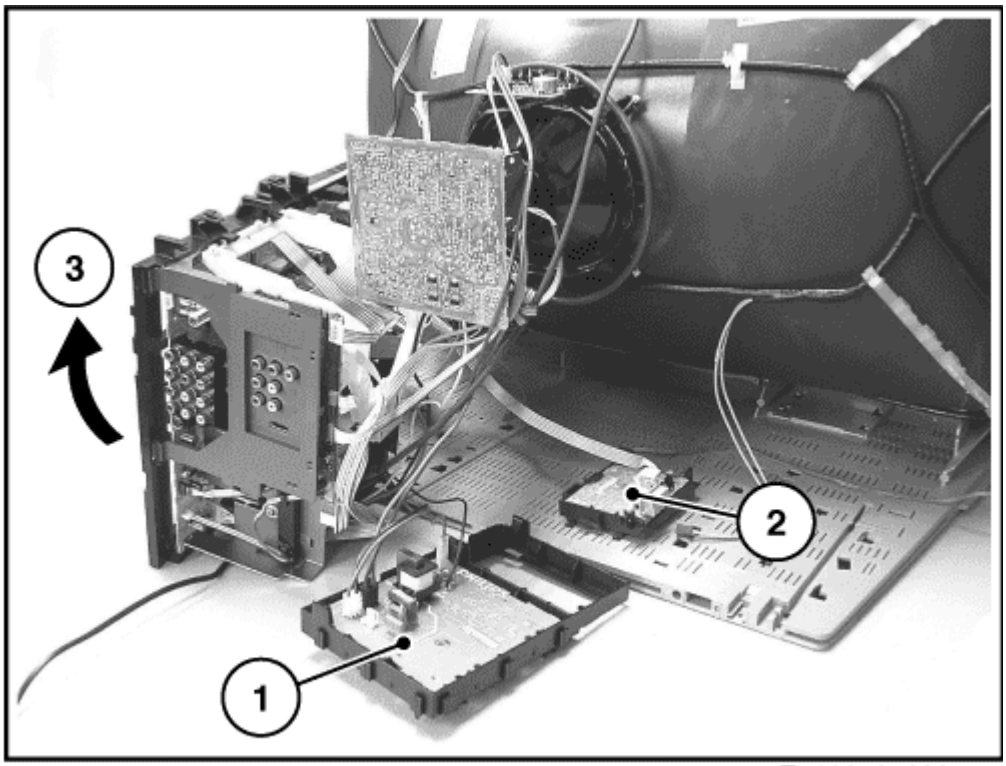

Figure: Service position 2

Assies/Panels Removal

Sometimes, it can be necessary to swap a complete assy or Printed Wiring Board (PWB). How that can be done is explained below.

Top Control Assy/Panel

1. Remove the two fixation screws:
   - PV2 styling: assy is mounted into the front cabinet;
   - FL13 styling: assy is mounted into the rear cover.
2. Push the assy a little bit upwards, and then pull it backwards to release it from the front hinge.
3. Lift the panel from its bracket, while releasing the four fixation clamps.

Side I/O Assy and Panel

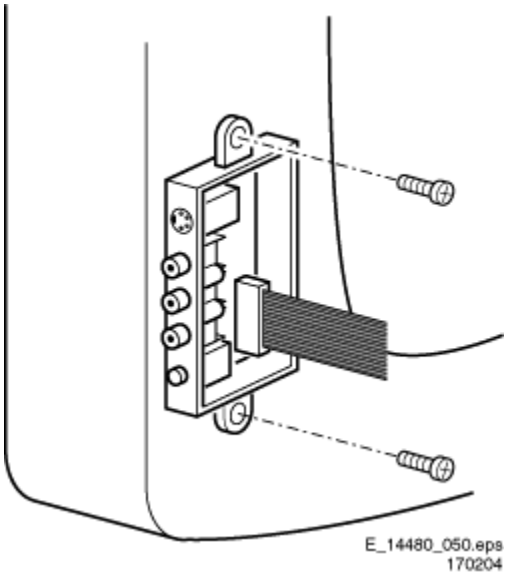

Figure: Side-I/O assy/panel

1. Remove the two fixation screws, and remove the complete Side I/O assembly.
2. Release the two fixation clamps, and lift the panel from the bracket.

HDMI Assy/Panel Removal

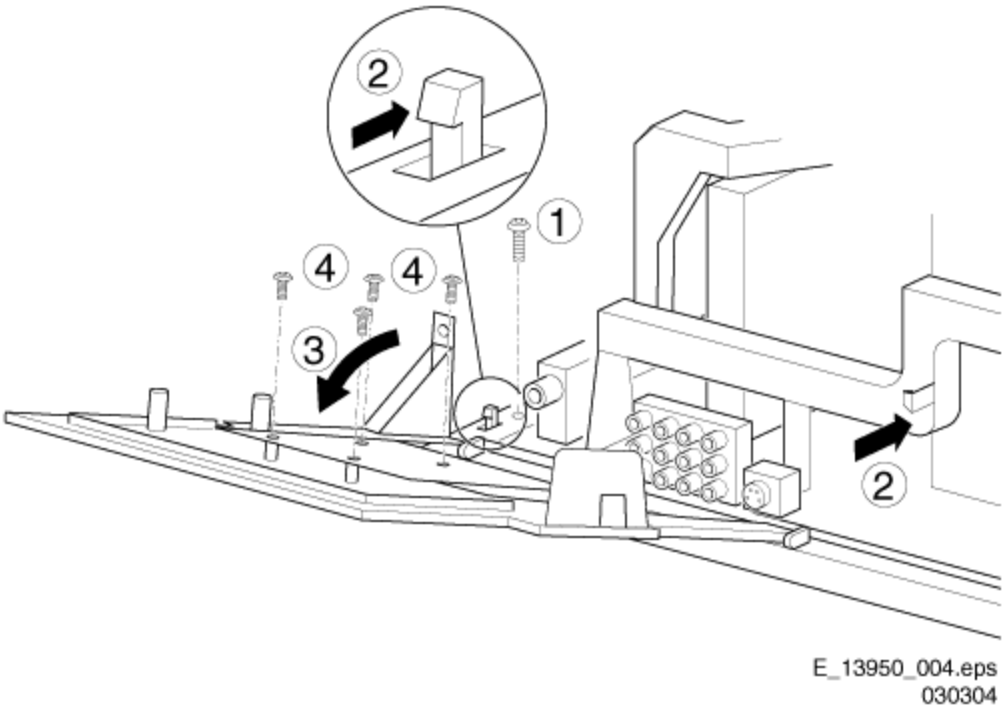

Figure: HDMI assy/panel

1. Remove the fixation screw (1) (if present).
2. Release the two pegs (2), by pushing them towards CRT.
3. At the same time, pull the complete module away from the LSP bracket (3). It hinges in the LSP bracket.
4. Remove the four fixing screws (4), and remove the panel.

Front Interface Assy/Panel

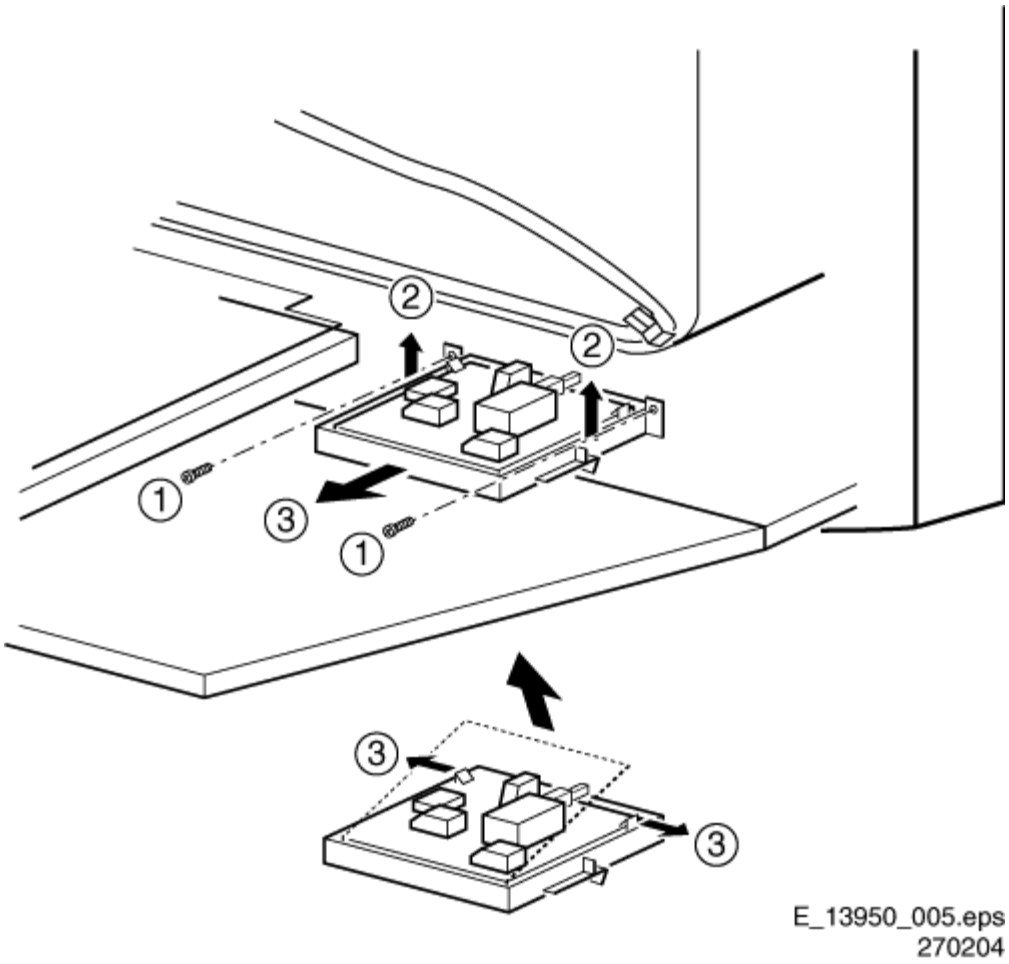

Figure: Front Interface assy/panel

1. Remove the two fixation screws (1).
2. Remove the complete module from the bottom plate, by pulling the two fixation clamps upward (2), while sliding the module away from the CRT (3).
3. Release the two clamps (4) at the sides of the bracket and lift panel out (it hinges at one side).

VDAF Assy/Panel

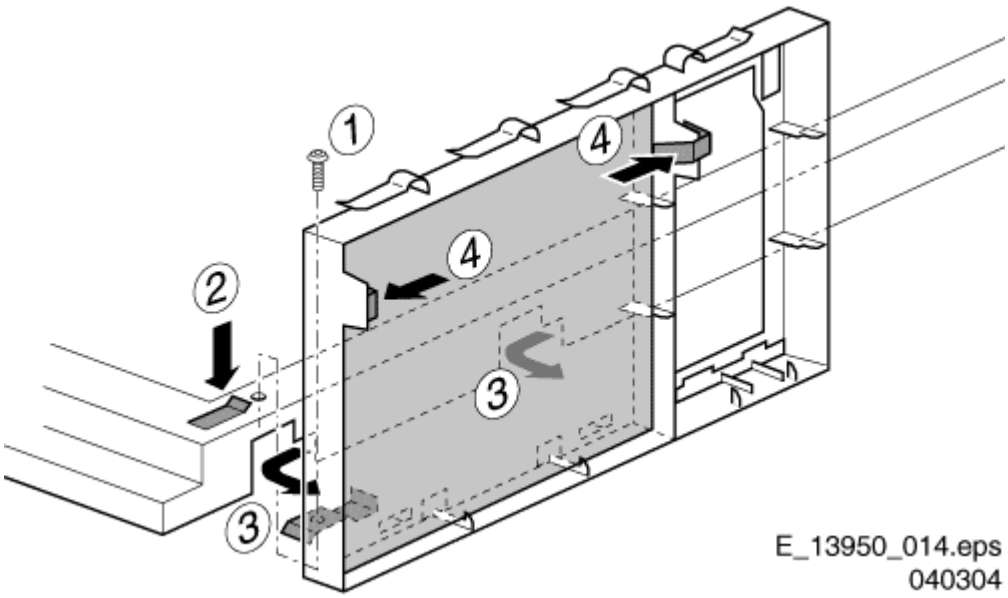

Figure: VDAF assy/panel

1. Remove the fixation screw (1) (if present).
2. Push down the fixation clamp (2), and pull the complete bracket at the same time away from the CRT (3). The module is now free from the LSP-bracket.
3. Release the two clamps (4) at the sides of the bracket and lift panel out.

Small Signal Board (SSB)

In fact, there is no predefined service position for the SSB. Most test points are located on the A-side (side that is facing the tuner).
If you have to replace ICs, you must take the complete SSB module out of the SIMM-connector.

To get access to the SSB test points, do the following:

1. Put the LSP in service position 1 (as described above).
2. Remove the fixation screws, which hold the SSB-bracket (1).
3. Release the clamping jaw at the top of the SSB bracket (2) and (3).
4. Push the two clamping lugs outwards, and pull the top of the bracket at the same time upwards (4) and (5).
5. Now you can remove the complete bracket. Push it, at the height of the LSP-bracket, towards the CRT (6) and lift it out of the LSP-bracket (7).
6. Take the SSB out, disconnecting it from the LSP.

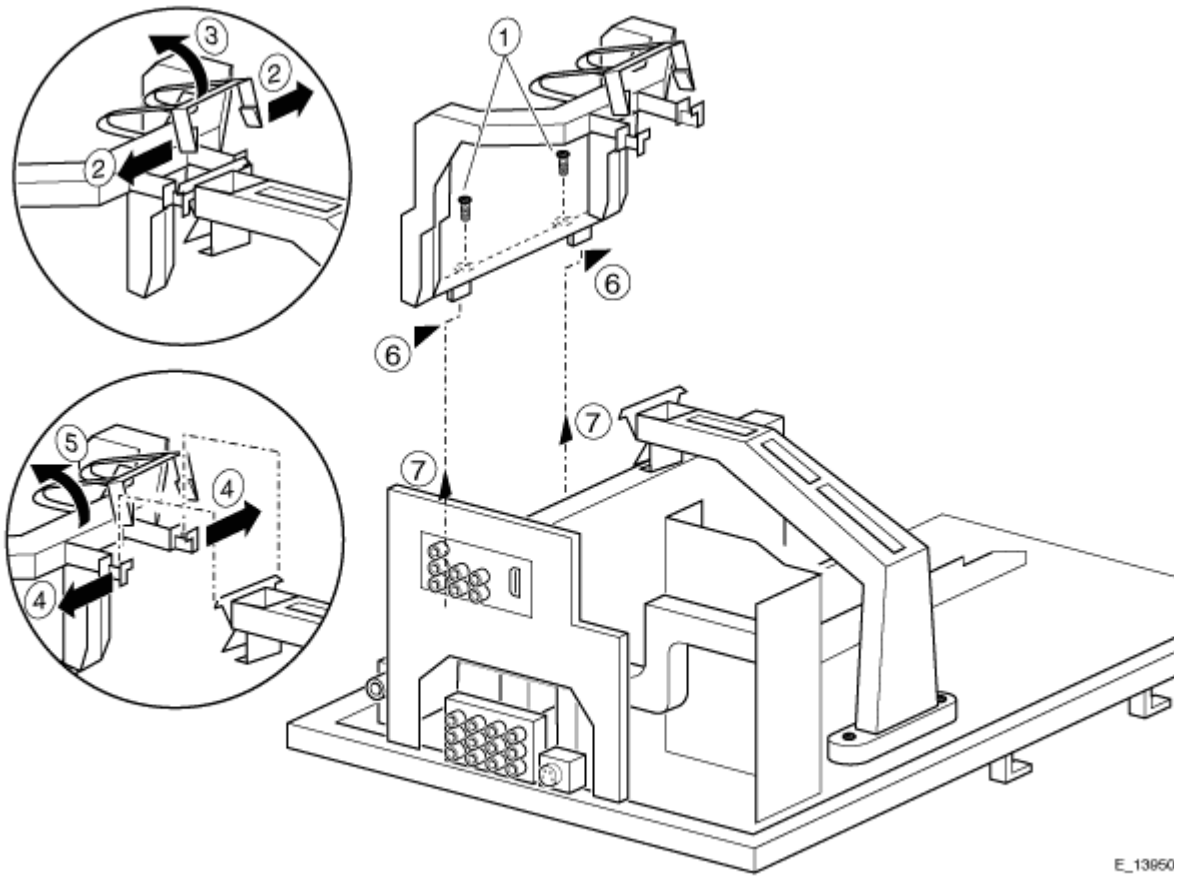

Figure: Small signal board

Notes:

- For better access to the SSB, it is possible to order an 'extension tool' with cables. You can use this service extension tool to connect a Small Signal Board (SSB) of an Axx or EMx chassis, via two 'IDE' cables to the SIMM connector in the set. In this way, you can service the SSB more easily outside the TV set. You can order this tool under 12nc: 9965 000 14526.
- If necessary for the measurement, you can put the LSP in the 'service position 2' (as described above).

Large Signal Panel (LSP)

1. Remove the HDMI assy (see paragraph 'HDMI assy/panel above).
2. Remove the SSB (see paragraph 'Small Signal Board (SSB)' above).

3. Disconnect the necessary cables.
4. Remove the fixation screw, which is located nearby the SIMM-connector.
5. Release the fixation clamps on the left of the LSP-bracket (the panel hinges at the right side).
6. Remove the panel from the bracket.

Set Re-assembly

To re-assemble the whole set, do all processes in reverse order.

Note : be sure that, before the rear cover is mounted:

- The mains cord is mounted correctly in its guiding brackets.
- All wires/cables are returned in their original positions. This is very important due to the large 'hot' area of the set

Philips Consumer Electronics

Technical Service Data

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P.O. Box 14810
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Manual 7660
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First Publish: 04-21-2004
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Print Date: 3/10/2006

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REFER TO SAFETY GUIDELINES

SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

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Parts List

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Large Signal Panel

	Large Signal Panel Parts	
CBA	Large Signal Panel Asm..	3139 188 01011
0068	Cinch Connector Support.	3104 304 24551
0139	Spring for Bracket	3122 121 24786
0300	Line Deflection Spring	3104 301 23611
1200	Tuner, V+U PLL	2422 542 90119
1205	Connector, SIMM, 80 Pin.	2422 025 17242
1417	Connector, 2 Pin	2422 025 16269
1424	Connector, 7 Pin	2422 025 11244
1491	Connector, 1 Pin.	2422 015 18552
1498	Connector, 2 Pin	2422 025 04849
1499	Connector, 2 Pin	2422 025 04849
1501	Fuse, 5X20, 6.3 Amp, 250V.	2422 086 00194
1502	Connector, 2 Pin	2422 025 16375
1503	Fuse, 5X20, 4Amp, 250V	2422 086 10222
1505	Connector, 2 Pin	2422 025 16269
1511	Socket Fuse.	2422 088 00271
1512	Socket Fuse.	2422 088 00271
S 1550	Relay, 1 Pin, 5V, 5A	2422 132 07411
1590	Surge Protector, DSP-501N-A21F	2422 549 42349
1591	Surge Protector, DSP-501N-A21F	2422 549 42349
1601	PROT DEV 125MA 65V MP13 A	2422 086 10919
1620	Connector, 3 Pin	2412 020 00725
1625	Connector, 3 Pin	2422 025 16382
1735	Connector, 4 Pin	2422 025 15847
1900	Socket, Cinch, 12 Pin.	2422 026 05064
1901	Socket, MDIN, 10 Pin	2422 026 04926
1936	Connector, 11 Pin.	2422 025 12485
1940	Connector, 11 Pin.	2422 025 12485
1943	Connector, 3 Pin	2422 025 09191
1945	Connector, 3 Pin	2422 025 16382
1947	Connector, 5 Pin	2422 025 12481
1951	Connector, 5 Pin	2422 025 12481
2101	Cap, 2n2, 10%, 400v, Metalized Polyeste	2222 370 65222
2102	Cap, 100u, 20%, 25v, Electrolytic. . .	3198 025 31010
2103	Cap, 100p, 5%, 50v, Ceramic.	3198 016 31010
2104	Cap, 2200u, 20%, 16v, Electrolytic . .	3198 038 22220
2105	Cap, 100p, 5%, 50v, Ceramic.	3198 016 31010
2107	Cap, 3n3, 10%, 400v, Metalized Polyeste	2222 370 65332
2108	Cap, 10n, 10%, 400v, Metalized Polyeste	2222 370 65103
2109	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2110	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2111	Cap, 47n, 10%, 50v, Polyester.	3198 014 04730
2112	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2115	Cap, 22u, 20%, 100v, Electrolytic. . .	3198 025 72290
2116	Cap, 100p, 10%, 1000v, Ceramic	3198 019 51010
2118	Cap, 1000u, 20%, 25v, Electrolytic . .	3198 026 31020
2119	Cap, 2u2, 20%, 16v, Electrolytic . . .	3198 026 22220
2120	Cap, 1n5, 10%, 2000v, Ceramic.	3198 019 71520
2121	Cap, 22n, 10%, 250v, Metalized Polyeste	2222 370 35223
2122	Cap, 22n, 10%, 250v, Metalized Polyeste	2222 370 35223
2126	Cap, 2u2, 20%, 16v, Electrolytic . . .	3198 026 22220
2130	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2131	Cap, 470p, 10%, 50v, Ceramic	3198 017 34710
2132	Cap, 2n2, 10%, 500v, Ceramic	3198 019 42220
2140	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2141	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2143	Cap, 2n2, 10%, 500v, Ceramic	3198 019 42220
2144	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2145	Cap, 470p, 10%, 50v, Ceramic	3198 017 34710
2147	Cap, 15n, 10%, 50v, Ceramic.	3198 017 31530
2148	Cap, 3n3, 10%, 500v, Ceramic	3198 019 43320
2149	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2150	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2151	Cap, 100u, 20%, 25v, Electrolytic. . .	3198 025 31010
2153	Cap, 6n8, 10%, 50v, Ceramic.	3198 017 36820
2154	Cap, 33n, 10%, 16v, Ceramic.	3198 017 33330
2155	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040
2156	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2157	Cap, 3n3, 10%, 50v, Polyester.	3198 014 03320
2159	Cap, 470p, 5%, 50v, Ceramic.	3198 016 34710
2160	Cap, 470p, 5%, 50v, Ceramic.	3198 016 34710
2161	Cap, 680p, 10%, 1000v, Ceramic	3198 019 66810
S 2163	Cap, 100n, 20%, 275V, Metalized Polypro pylene	2222 338 22104
2200	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2201	Cap, 220n, +80/-20%, 16v, Ceramic. . .	3198 017 42240
2202	Cap, 220n, +80/-20%, 50v, Ceramic. . .	2238 580 19814
2203	Cap, 47u, 20%, 25v, Electrolytic . . .	3198 025 34790
2400	Cap, 47u, 20%, 160v, Electrolytic. . .	2020 021 91139
2401	Cap, 6n8, 10%, 400v, Metalized Polyeste	2222 365 55682
2402	Cap, 47u, 20%, 250v, Electrolytic. . .	2020 012 93786
2403	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2404	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2412	Cap, 47n, +80/-20%, 50v, Ceramic . . .	3198 024 44730
2413	Cap, 10u, 20%, 50v, Electrolytic . . .	2020 021 91548
2414	Cap, 47n, +80/-20%, 50v, Ceramic . . .	3198 024 44730
2415	Cap, 220p, 5%, 50v, Ceramic.	3198 016 32210
2417	Cap, 220n, +80/-20%, 25v, Ceramic. . .	3198 023 22240
2419	Cap, 470p, 10%, 2000v, Ceramic	3198 019 74710
2420	Cap, 680p, 5%, 2000v, Polypropylene. .	2222 375 90229
2421	Cap, 1u2, 5%, 250v, Metalized Polypropy lene	2022 333 00097
2425	Cap, 10n, 5%, 2000v, Polypropylene . .	2222 375 90175
2426	Cap, 22n, 5%, 630v, Polypropylene. . .	2222 375 90219
2430	Cap, 2n2, 10%, 500v, Ceramic	3198 019 42220
2431	Cap, 2n2, 10%, 500v, Ceramic	3198 019 42220
2433	Cap, 360n, 5%, 250v, Metalized Polyprop ylene.	2222 479 90019
2440	Cap, 1u, 10%, 16v, Ceramic	2020 552 96448
2443	Cap, 470p, 10%, 50v, Ceramic	3198 017 04710
2444	Cap, 1u, 10%, 16v, Ceramic	2020 552 96448
2448	Cap, 1u, 10%, 16v, Ceramic	2020 552 96448
2450	Cap, 220n, 10%, 50v, Polyester	3198 014 02240
2451	Cap, 1000u, 20%, 10v, Electrolytic . .	2020 012 93757
2454	Cap, 15n, 10%, 50v, Ceramic.	3198 017 31530
2455	Cap, 1n, 10%, 50v, Ceramic	3198 017 31020
2457	Cap, 15n, 10%, 50v, Ceramic.	3198 017 01530
2458	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310
2460	Cap, 1000u, 20%, 16v, Electrolytic . .	3198 026 21020
2461	Cap, 1n5, 10%, 500v, Ceramic	3198 019 41520
2462	Cap, 470u, 20%, 25v, Electrolytic. . .	3198 026 34710
2463	Cap, 470p, 10%, 500v, Ceramic.	3198 019 44710
2464	Cap, 470u, 20%, 25v, Electrolytic. . .	2020 021 91844
2465	Cap, 470p, 10%, 500v, Ceramic.	3198 019 44710
2466	Cap, 100n, +80/-20%, 25v, Ceramic. . .	3198 023 41040
2468	Cap, 470p, 10%, 500v, Ceramic.	3198 019 44710
2480	Cap, 6n8, 10%, 50v, Ceramic.	3198 017 36820
2482	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2483	Cap, 15n, 10%, 50v, Ceramic.	3198 017 31530
2490	Cap, 100u, 20%, 50v, Electrolytic. . .	3198 037 51010
2491	Cap, 22u, 20%, 50v, Electrolytic . . .	3198 025 52290
2492	Cap, 100u, 20%, 10v, Electrolytic. . .	3198 025 11010
2494	Cap, 220n, 10%, 16v, Ceramic	2238 780 15654
2495	Cap, 220n, 10%, 16v, Ceramic	2238 780 15654
2496	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2497	Cap, 33n, 10%, 50v, Ceramic.	3198 017 03330
2498	Cap, 1u, 10%, 16v, Ceramic	2020 552 96448
2499	Cap, 3n3, 10%, 50v, Ceramic.	3198 017 33320
2501	Cap, 1n, 10%, 2000v, Ceramic	3198 019 71020
2503	Cap, 39n, 5%, 100v, Metalized Polyester	2222 370 86393
2504	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2505	Car, 2n2, 20%, 250v, Ceramic	2020 554 90201
2506	Cap, 47n, 10%, 50v, Polyester.	3198 014 04730
2507	Cap, 470n, 20%, 275V, Metalized Polypro pylene	2222 338 22474
2508	Cap, 22n, 20%, 275v, Metalized Polyprop ylene.	2222 336 29139
2509	Cap, 22n, 20%, 275v, Metalized Polyprop ylene.	2222 336 29139
2510	Cap, 220p, 10%, 2000v, Ceramic	3198 019 72210
2512	Cap, 1000u, 20%, 35v, Electrolytic . .	3198 026 41020
2513	Cap, 470p, 10%, 50v, Ceramic	3198 017 34710
2514	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220
2515	Cap, 47u, +50/-10%, 200v, Electrolytic	2020 021 91303
2516	Cap, 680u, 20%, 200v, Electrolytic . .	2020 024 90723
2518	Cap, 330p, 10%, 500v, Ceramic.	3198 019 43310
2519	Cap, 2n2, 10%, 500v, Ceramic	3198 019 42220
2521	Cap, 1n, 20%, 250v, Ceramic.	2020 554 90198
2525	Cap, 1n5, 10%, 50v, Ceramic.	3198 017 31520
2526	Cap, 2n2, 10%, 1000v, Ceramic.	2020 558 90571
2527	Cap, 470p, 10%, 2000v, Ceramic	3198 019 74710
2528	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2529	Cap, 100n, +80/-20%, 50v, Ceramic. . .	2238 580 19812
2530	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2531	Cap, 1n5, 10%, 500v, Ceramic	3198 019 41520
2532	Cap, 1u, 10%, 10v, Ceramic	2020 552 96372
2533	Cap, 4n7, 10%, 250v, Ceramic	2020 557 90732
2535	Cap, 4n7, 10%, 50v, Ceramic.	3198 017 34720
2537	Cap, 22n, 20%, 275v, Metalized Polyprop ylene.	2222 336 29139
2538	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030
2539	Cap, 10u, 20%, 35v, Electrolytic . . .	3198 028 41090
2540	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2541	Cap, 330p, 10%, 500v, Ceramic.	3198 019 43310
2544	Cap, 1n, 10%, 50v, Ceramic	3198 017 31020
S 2547	Cap, 100n, 20%, 275V, Metalized Polypro pylene	2222 338 22104
2601	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2603	Cap, 220p, 5%, 50v, Ceramic.	3198 016 32210
2604	Cap, 220n, +80/-20%, 50v, Ceramic. . .	2238 580 19814
2605	Cap, 220p, 5%, 50v, Ceramic.	3198 016 32210
2620	Cap, 220n, +80/-20%, 50v, Ceramic. . .	2238 580 19814
2621	Cap, 100n, +80/-20%, 25v, Ceramic. . .	3198 023 41040
2622	Cap, 100u, 20%, 50v, Electrolytic. . .	3198 025 51010
2623	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220
2624	Cap, 470n, 10%, 50v, Polyester	3198 014 04740
2625	Cap, 470n, 10%, 50v, Polyester	3198 014 04740
2627	Cap, 10u, 20%, 100v, Electrolytic. . .	3198 025 71090
2628	Cap, 100u, 20%, 50v, Electrolytic. . .	3198 025 51010
2630	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2631	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2633	Cap, 15n, 10%, 50v, Ceramic.	3198 017 31530

S = Safety Part Be sure to use exact replacement part.

2635	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2642	Cap, 100u, 20%, 50v, Electrolytic. . .	3198 025 51010
2653	Cap, 6n8, 10%, 50v, Ceramic.	3198 017 36820
2656	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2657	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2659	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230
2660	Cap, 1n, 10%, 50v, Ceramic	3198 017 31020
2662	Cap, 3n3, 10%, 50v, Ceramic.	3198 017 33320
2701	Cap, 1u, +80/-20%, 16v, Ceramic. . . .	3198 017 21050
2702	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2703	Cap, 1u, +80/-20%, 16v, Ceramic. . . .	3198 017 21050
2704	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2707	Cap, 1u, +80/-20%, 16v, Ceramic. . . .	3198 017 21050
2708	Cap, 470u, 20%, 25v, Electrolytic. . .	3198 026 34710
2709	Cap, 1000u, 20%, 50v, Electrolytic . .	3198 026 51020
2710	Cap, 100n, +80/-20%, 50v, Ceramic. . .	2238 580 19812
2711	Cap, 1000u, 20%, 25v, Electrolytic . .	3198 026 31020
2712	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2713	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2714	Cap, 1000u, 20%, 25v, Electrolytic . .	3198 026 31020
2715	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2716	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2722	Cap, 100u, 20%, 50v, Electrolytic. . .	3198 025 51010
2914	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2915	Cap, 10u, 20%, 50v, Electrolytic . . .	3198 025 51090
2918	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040
2940	Cap, 100u, 20%, 10v, Electrolytic. . .	3198 025 11010
2941	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040
2942	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040
2943	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040
2945	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2946	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2947	Cap, 4u7, 20%, 50v, Electrolytic . . .	3198 025 54780
2950	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2951	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2991	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310
2992	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310
2993	Res, 33K, 5%, 1/10W, Metalized Glass .	3198 021 53330
2994	Res, 33K, 5%, 1/10W, Metalized Glass .	3198 021 53330
2998	Res, 33K, 5%, 1/10W, Metalized Glass .	3198 021 53330
2999	Res, 33K, 5%, 1/10W, Metalized Glass .	3198 021 53330
3101	Res, 4M7, 5%, 1/4W, Metalized Glass. .	2322 241 53475
3102	Res, 1K, 1%, 3/5W, Metal Film.	2312 915 11002
3103	Res, 1K, 1%, 3/5W, Metal Film.	2312 915 11002
3104	Res, 47 ohm, 5%, 1/6W, Carbon Film . .	3198 011 04790
3105	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3106	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3107	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3108	Res, 2R2, 5%, 1/6W, Carbon Film. . . .	3198 011 02280
3111	Res, 1K5, 5%, 1W, Metal Film	3198 012 11520
3113	Res, 22 ohm, 5%, 1/6W, Carbon Film . .	3198 011 02290
3114	Res, 330 ohm, 5%, 1/6W, Carbon Film. .	3198 011 03310
3115	Res, 22K, 5%, 1/6W, Carbon Film. . . .	3198 011 02230
3116	Res, 22K, 5%, 1/6W, Carbon Film. . . .	3198 011 02230
3117	Res, 47 ohm, 5%, 1/6W, Carbon Film . .	3198 011 04790
3118	Res, 2R2, 5%, 1/6W, Carbon Film. . . .	3198 011 02280
3121	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
3123	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3124	Res, 68 ohm, 5%, 1/6W, Carbon Film . .	3198 011 06890
3125	Res, 15 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01590
3126	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030
3127	Res, 5K6, 5%, 1/6W, Carbon Film. . . .	3198 011 05620
3130	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
3131	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710
3132	Res, 47 ohm, 5%, 1/10W, Metalized Glass	3198 021 54790
3133	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3134	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3135	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3136	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
3137	Res, 4K7, 1%, 3/5W, Metal Film	2312 915 14702
3138	Res, 1M, 5%, 1/10W, Metalized Glass. .	3198 021 51050
3140	Res, 22K, 5%, 1/10W, Metalized Glass .	3198 021 52230
3141	Res, 2K7, 5%, 1/6W, Carbon Film. . . .	3198 011 02720
3142	Res, 3K3, 5%, 1/16W, Metalized Glass .	3198 021 33320
3143	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3144	Res, 220 ohm, 5%, 1W, Metal Film . . .	3198 012 12210
3150	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3151	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
3152	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3153	Res, 4K7, 5%, 1/10W, Metalized Glass .	3198 021 54720
3155	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3156	Res, 100 ohm, 1%, 1/16W, Metalized Glas	2322 704 61001
3157	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3158	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322 704 61801
3159	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3160	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3161	Res, 100 ohm, 5%, 1/3W, Metal Film . .	2306 204 03101
3164	Res, 100K, 5%, 1/16W, Metalized Glass.	3198 021 31040
3165	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322 704 61801
3168	Res, 4K7, 5%, 1/10W, Metalized Glass .	3198 021 54720
3169	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3170	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3171	Res, 68K, 5%, 1/6W, Carbon Film. . . .	3198 011 06830
3172	Res, 68K, 5%, 1/6W, Carbon Film. . . .	3198 011 06830
3200	Res, 22 ohm, 5%, 1/10W, Metalized Glass	3198 021 52290
3201	Res, 22 ohm, 5%, 1/10W, Metalized Glass	3198 021 52290
3250	Res, Zero ohm, "Chip" Jumper	3198 021 90020
3261	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3262	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3400	Res, 1 ohm, 5%, 1/2W, Metal Film . . .	2306 207 03108
3401	Res, 27 ohm, 5%, Metal Film.	2322 195 63279
3402	Res, 120 ohm, 5%, Metal Film	2322 193 53121
3403	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010
3404	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
3406	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3407	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3409	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3410	Res, 47 ohm, 5%, 1/10W, Metalized Glass	3198 021 54790
3411	Res, 39 ohm, 5%, 1/4W, Carbon.	2122 101 02111
3412	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 021 31220
3414	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
3415	Res, 15 ohm, 5%, 2 1/2W, Metal Film. .	3198 012 31590
3417	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3418	Res, 56K, 1%, 3/5W, Metal Film	2312 915 15603
3419	Res, 470K, 5%, 1/16W, Metalized Glass.	3198 021 34740
3420	Res, 3K3, 5%, 1/16W, Metalized Glass .	3198 021 33320
3421	Res, 470K, 5%, 1/16W, Metalized Glass.	3198 021 34740
3422	Res, 3K3, 5%, 1/16W, Metalized Glass .	3198 021 33320
3423	Res, 6R8, 5%, 1W, Metal Film	3198 012 16880
3425	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3426	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3427	Res, 82K, 5%, 1/16W, Metalized Glass .	3198 021 38230
3428	Res, 680K, 5%, 1/16W, Metalized Glass.	3198 021 36840
3429	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3430	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
3431	Res, 150 ohm, 5%, 1/2W, Metal Film . .	2306 207 03151
3432	Res, 560K, 5%, 1/16W, Metalized Glass.	2322 702 60564
3440	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3441	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 021 32230
3442	Res, 470K, 5%, 1/16W, Metalized Glass.	3198 021 34740
3443	Res, 680K, 5%, 1/16W, Metalized Glass.	3198 021 36840
3447	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3448	Res, 1K2, 5%, 1/10W, Metalized Glass .	3198 021 51220
3449	Res, 100 ohm, 5%, 1/3W, Metal Film . .	2306 204 03101
3450	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030
3451	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030
3452	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710
3453	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3454	Res, 1 ohm, 5%, 1/10W, Metalized Glass	3198 021 51080
3455	Res, 8K2, 5%, 1/16W, Metalized Glass .	3198 021 38220
3456	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820
3457	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
3458	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
3459	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
S 3460	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108
S 3461	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108
3462	Res, 1 ohm, 5%, 1/2W, Metal Film . . .	2306 207 03108
3463	Res, 1 ohm, 5%, 1/2W, Metal Film . . .	2306 207 03108
3464	Res, 1 ohm, 5%, 1/2W, Metal Film . . .	2306 207 03108
3465	Res, 1 ohm, 5%, 1/2W, Metal Film . . .	2306 207 03108
3466	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3467	Res, 100K, 5%, 1/16W, Metalized Glass.	3198 021 31040
3472	Res, 39K, 5%, 1/16W, Metalized Glass .	3198 021 33930
3474	Res, 56K, 5%, 1/16W, Metalized Glass .	3198 021 35630
3475	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3476	Res, 220K, 5%, 1/6W, Carbon Film . . .	3198 011 02240
3478	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010
3479	Res, 4R7, 5%, 1/3W, Metal Film	2306 204 03478
3480	Res, 4R7, 5%, 1/3W, Metal Film	2306 204 03478
3481	Res, 100 ohm, 5%, 1/8W, Metalized Glass	2322 750 61001
3482	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
3483	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820
3484	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3485	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
3486	Res, 7K5, 1%	2322 704 67502
3487	Res, 8K2, 1%, 1/16W, Metalized Glass .	2322 704 68202
3488	Res, 1M, 1%, 3/5W, Metal Film.	2312 915 11005
3489	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3490	Res, 3K3, 5%, 1/16W, Metalized Glass .	3198 021 33320
3491	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 021 32730
3492	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010
3495	Res, 15K, 1%, 3/5W, Metal Film	2312 915 11503
3496	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
3497	Res, 33K, 5%, 1/16W, Metalized Glass .	3198 021 33330
3500	Res, 0R56, 5%, 10W, Wire Wound	2322 253 41567
3501	Res, 100 ohm, 20%, 1/2W, Carbon Film .	2120 103 90057
3502	Res, 4M7, 5%, 1/2W, Metalized Glass. .	2322 242 13475
3503	Res, 4M7, 5%, 1/2W, Metalized Glass. .	2322 242 13475
3504	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220
3505	Res, 150K, 5%, 1/6W, Carbon Film . . .	3198 011 01540
3506	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
3507	Res, 160K, 1%, 3/5W, Metal Film. . . .	2312 915 11604
3508	Res, 15 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01590
S 3509	VDR, 1mA/423V, MAX 800V	2322 595 90025

S = Safety Part Be sure to use exact replacement part.

3510	Res, 1K, 1%, 1/8W, Metalized Glass . .	2322 734 61002	
3511	Res, 1K5, 5%, 1 1/3W, Metal Film . . .	3198 012 22220	
3512	Res, 330K, 5%, 1/16W, Metalized Glass.	3198 021 33340	
3513	Res, 330K, 5%, 1W, Metal Film.	2322 193 53334	
3514	Res, 0R22, 5%, 3/5W, Metal Film. . . .	3198 012 12270	
3515	Res, 0R22, 5%, 3/5W, Metal Film. . . .	3198 012 12270	
3517	Res, 47K, 5%, 1/10W, Metalized Glass .	3198 021 54730	
3518	Res, 330K, 5%, 1/4W, Metalized Glass .	2322 241 53334	
3519	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 021 31220	
3520	Res, 33K, 5%, 1 1/3W, Metal Film . . .	3198 012 23330	
3521	Res, 1M5, 5%, 1/2W, Metalized Glass. .	2322 242 13155	
3522	Res, 6K8, 5%, 1/10W, Metalized Glass .	3198 021 56820	
3523	Res, 1M, 5%, 1/10W, Metalized Glass. .	3198 021 51050	
3524	Res, 33K, 5%, 1/16W, Metalized Glass .	3198 021 33330	
3525	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790	
3527	Res, 2K, 1%, 1/8W, Metalized Glass . .	2322 734 62002	
3528	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3529	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720	
3530	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3531	Res, 4K7, 5%, 1/10W, Metalized Glass .	3198 021 54720	
3532	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3533	Res, 15 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01590	
3534	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3535	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790	
3536	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520	
3537	Res, 1K, 5%, 1/3W, Metal Film.	2306 204 03102	
3538	Res, 33K, 5%, 1/10W, Metalized Glass .	3198 021 53330	
3539	Res, 39K, 5%, 1/10W, Metalized Glass .	3198 021 53930	
3540	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030	
3541	Res, 22 ohm, 5%, 1/6W, Carbon Film . .	3198 011 02290	
3543	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	
3544	Res, 39K, 5%, 1/10W, Metalized Glass .	3198 021 53930	
3547	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210	
3548	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	
3549	Res, 39K, 5%, 1/16W, Metalized Glass .	3198 021 33930	
3550	Res, PTC, 1R5, 20%, 145v, DBL-MONO . .	2322 662 96753	
3551	Res, 330 ohm, 5%, 1/6W, Carbon Film. .	3198 011 03310	
3552	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820	
3553	Res, 15K, 5%, 1/16W, Metalized Glass .	3198 021 31530	
3554	Res, 6M8, 1%, 25V, Metalized Glass . .	2322 241 86805	
3555	Res, 680K, 5%, 1/10W, Metalized Glass.	3198 021 56840	
3556	Res, 47K, 1%, 1/8W, Metalized Glass. .	2322 734 64703	
3557	Res, 220K, 1%, 1/8W, Metalized Glass .	2322 734 62204	
3558	Res, 47K, 1%, 1/8W, Metalized Glass. .	2322 734 64703	
3559	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030	
3560	Res, 1M2, 1%, 1/8W, Metalized Glass. .	2322 734 61205	
3562	Res, 100 ohm, 20%, 1/2W, Carbon Film .	2120 103 90057	
3610	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 021 32230	
3611	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220	
3620	Res, 1R2, 5%, Carbon	2122 101 02108	
3621	Res, 1R5, 5%, 1/4W, Carbon Film. . . .	2122 101 02083	
3622	Res, 1R5, 5%, 1/4W, Carbon Film. . . .	2122 101 02083	
3623	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030	
3624	Res, 1R5, 5%, 1/3W, Metal Film	2306 204 03158	
3625	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210	
3626	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210	
3627	Res, 10K, 5%, 1/10W, Metalized Glass .	3198 021 51030	
3630	Res, 33K, 5%, 1/16W, Metalized Glass .	3198 021 33330	
3631	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610	
3632	Res, 6K8, 5%, 1/16W, Metalized Glass .	3198 021 36820	
3633	Res, 56K, 5%, 1/16W, Metalized Glass .	3198 021 35630	
3634	Res, 39K, 5%, 1/6W, Carbon Film. . . .	3198 011 03930	
3635	Res, 330 ohm, 5%, 1/6W, Carbon Film. .	3198 011 03310	
3636	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 021 32230	
3637	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3638	Res, 470K, 5%, 1/16W, Metalized Glass.	3198 021 34740	
3639	Res, 56K, 5%, 1/16W, Metalized Glass .	3198 021 35630	
3640	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220	
3641	Res, 470 ohm, 5%, 1/6W, Carbon Film. .	3198 011 04710	
3642	Res, Trimer, 47K	2120 363 90166	
3643	Res, 330K, 5%, 1/16W, Metalized Glass.	3198 021 33340	
3644	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210	
3645	Res, 150K, 5%, 1/6W, Carbon Film . . .	3198 011 01540	
3646	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3647	Res, 2R2, 5%, 1/10W, Metalized Glass .	3198 021 52280	
3652	Res, 47 ohm, 5%, 1/10W, Metalized Glass	3198 021 54790	
3655	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3656	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 021 31220	
3657	Res, 33K, 5%, 1/16W, Metalized Glass .	3198 021 33330	
3658	Res, 33K, 5%, 1/16W, Metalized Glass .	3198 021 33330	
3659	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220	
3660	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620	
3661	Res, 470 ohm, 5%, 1/6W, Carbon Film. .	3198 011 04710	
3662	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520	
3663	Res, 150 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01510	
3664	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3681	Res, 1K2, 5%, 1/6W, Carbon Film. . . .	3198 011 01220	
3682	Res, 100K, 5%, 1/16W, Metalized Glass.	3198 021 31040	
3683	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3684	Res, 6K8, 5%, 1/16W, Metalized Glass .	3198 021 36820	
3685	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 021 32730	
3686	Res, 56K, 5%, 1/16W, Metalized Glass .	3198 021 35630	
3687	Res, 1K2, 5%, 1/6W, Carbon Film. . . .	3198 011 01220	
3688	Res, 680K, 5%, 1/10W, Metalized Glass.	3198 021 56840	
3690	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3701	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3702	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230	
3703	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3704	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230	
3707	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3708	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3710	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730	
3711	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3713	Res, 8R2, 5%, 1/16W, Metalized Glass .	2322 702 81828	
3714	Res, 8R2, 5%, 1/16W, Metalized Glass .	2322 702 81828	
3716	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030	
3719	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
S 3720	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108	
S 3721	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108	
3725	Res, 18K, 5%, 1/6W, Carbon Film. . . .	3198 011 01830	
3726	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011 01030	
3904	Res, 6R8, 5%, 1/3W, Metal Film	2306 204 03688	
3912	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
3928	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	
3929	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3930	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198 021 55610	
3938	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	
3939	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030	
3940	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198 021 55610	
3941	Res, 6R8, 5%, 1/3W, Metal Film	2306 204 03688	
3952	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590	
3953	Res, 150 ohm, 5%, 1/10W, Metalized Glas	3198 021 51510	
3954	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510	
3955	Res, 150 ohm, 5%, 1/10W, Metalized Glas	3198 021 51510	
3956	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510	
3957	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
3959	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
3961	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
3963	Wire Jumper, 0.58MM.	3198 036 90010	
3964	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590	
3965	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	
3966	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	
3967	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
3968	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590	
3969	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	
3970	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	
3995	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590	
3996	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
4702	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4703	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4704	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4790	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4901	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4902	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4903	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4904	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4905	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4912	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4913	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4914	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
S 5100	Transformer, BS25126-03 B	3104 308 20431	
5101	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5102	Coil, 10u.	3198 018 71090	
5103	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5104	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5105	Coil, 1u	2422 535 94632	
5106	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060	
5107	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060	
5108	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5110	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5111	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5113	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5130	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5131	Coil, 100u	3198 018 21010	
5400	Coil, 33u.	3198 018 73390	
5401	Coil, 12u.	2422 536 00059	
5402	Coil, 150u	3198 018 21510	
S 5410	Transformer, Signal Driver, S16944 Y .	2422 531 02447	
5411	Coil, 560n	2422 535 95339	
5421	Linear Correction Coil, PSL15-201B B .	2422 536 00608	
5422	Coil, Bridge, W7131-003 B	2422 531 02334	
5423	Coil, 560n	2422 535 95339	
5425	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5426	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5430	Transformer, LOT, 1392.9014A Y	3104 308 20491	
5461	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5463	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5465	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5467	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5469	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5502	AC Filter, 30MH 3A DMF3530 Y. . . .	2422 549 45783	
5504	AC Filter, 30MH 3A DMF3530 Y. . . .	2422 549 45783	
5505	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	
5507	Fixed, Inductor, 100MHz, 80 ohm. . . .	3198 018 90020	

S = Safety Part Be sure to use exact replacement part.

S 5512	Transformer, BS41030-02 B.	2422 531 02576	
5515	Coil, 33u.	3198 018 73390	
5517	Fixed, Inductor, 100MHz, 80 ohm.	3198 018 90020	
5518	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5519	Inductor, Fixed, 100MHz, 30 ohm.	3198 018 90060	
5520	Fixed, Inductor, 100MHz, 80 ohm.	3198 018 90020	
5620	Coil, 90n.	2422 535 95444	
S 5621	Transfromer, S13974-03 Y	3104 308 20571	
5901	Coil, 10u.	2422 535 94269	
5902	Coil, 100u	3198 018 71010	
5903	Coil, 33u.	2422 535 95595	
5904	Fixed, Inductor, 100MHz, 80 ohm.	3198 018 90020	
6080	Diode, Signal, BAS316.	3198 010 10630	
6082	Diode, Signal, BAT51, SOD323	3198 010 10660	
6103	Diode, Rect, RGP10D	9337 516 60673	
6104	Zener Diode, 22 volt	3198 020 52290	
6105	Zener Diode, 15 volt	3198 010 21590	
6106	Zener Diode, 22 volt	3198 010 52290	
6108	Diode, Signal, BAT51, SOD323	3198 010 10660	
6109	Diode, Rect, 1N5062	3198 010 10120	
6110	Diode, Rect, BYV95C	9335 001 80133	
6111	Diode, Rect, SB360	3198 010 10700	
6112	Zener Diode, 10 volt	3198 020 51090	
6115	Diode, Signal, BAT51, SOD323	3198 010 10660	
6120	Diode, Signal, 1N4148.	3198 010 10010	
6121	Diode, Signal, 1N4148.	3198 010 10010	
6122	Zener Diode, 3.9 volt.	3198 010 53980	
6130	Diode, Rect, BYW29EX-200.	9340 412 80127	
6132	Zener Diode, 6.8 volt.	9322 171 80685	
6133	Diode, Signal, BAS316.	3198 010 10630	
6134	Diode, Signal, BAS316.	3198 010 10630	
6141	Zener Diode, 15 volt	3198 020 51590	
6142	Diode, Signal, BAT51, SOD323	3198 010 10660	
6144	Diode, Signal, BAS316.	3198 010 10630	
6147	Zener Diode, 6.8 volt.	3198 010 26880	
6148	Diode, Rect, BYV27-200.	9335 526 80133	
6149	Diode, Signal, BAS316.	3198 010 10630	
6200	Zener Diode, 33 volt	3198 020 53390	
6400	Diode, Rect, RGP10D	9337 516 60673	
6401	Diode, Signal, BAS316.	3198 010 10630	
6402	Diode, Signal, BAS316.	3198 010 10630	
6405	Zener Diode, 47 volt	3198 010 24790	
6406	Diode, Signal, BAS316.	3198 010 10630	
6407	Diode, Signal, BAS316.	3198 010 10630	
6408	Diode, Rect, RGP10D	9337 516 60673	
6412	Diode, Signal, BAS316.	3198 010 10630	
6413	Diode, Signal, BAS316.	3198 010 10630	
6414	Zener Diode, 8.2 volt.	3198 020 58280	
6415	Zener Diode, 15 volt	3198 020 51590	
6421	Diode, Rect, BY359X-1500.	9340 303 30127	
6422	Diode, Rect, BY229X-600	9340 380 20127	
6442	Zener Diode, 15 volt	3198 020 51590	
6455	Diode, Signal, BAS316.	3198 010 10630	
6456	Diode, Signal, BAV99	3198 010 10620	
6457	Zener Diode, 2.7 volt.	3198 020 52780	
6458	Zener Diode, 5.6 volt.	3198 020 55680	
6460	Diode, Rect, BYV95C	9335 001 80133	
6462	Diode, Rect, BYW95C-24.	9340 559 53112	
6464	Diode, Rect, BYW95C-24.	9340 559 53112	
6480	Diode, Rect, RGP10D	9337 516 60673	
6481	Zener Diode, 15 volt	3198 020 51590	
6482	Diode, Signal, BAS316.	3198 010 10630	
6483	Diode, Signal, BAT51, SOD323	3198 010 10660	
6493	Diode, Signal, BAT51, SOD323	3198 010 10660	
6499	Zener Diode, 4.7 volt.	3198 020 54780	
6505	Zener Diode, 15 volt	3198 010 21590	
6506	Diode, Signal, BAT51, SOD323	3198 010 10660	
6507	Zener Diode, 56 volt	9322 150 19685	
6508	Zener Diode, 56 volt	9322 150 19685	
6509	Diode, Signal, BAS316.	3198 010 10630	
6510	Zener Diode, 33 volt	3198 010 23390	
6511	Diode, Signal, BAS316.	3198 010 10630	
6512	Diode, Signal, BAS316.	3198 010 10630	
6513	Zener Diode, 56 volt	9322 150 19685	
6515	Zener Diode, 6.8 volt.	9335 006 10133	
6516	Diode, Signal, BAS316.	3198 010 10630	
6517	Diode, Signal, BAT51, SOD323	3198 010 10660	
6522	Diode, Signal, BAS316.	3198 010 10630	
6523	Diode, Signal, BAT51, SOD323	3198 010 10660	
6525	Diode, Bridge Rect, GBU6JL-7002	9322 138 08667	
6530	Diode, Rect, BYV95C	9335 001 80133	
6533	Diode, Signal, BAT51, SOD323	3198 010 10660	
6534	Diode, Rect, DTV1500MFP	9322 165 72687	
6535	Diode, Rect, STPS8H100F	9322 132 53687	
6537	Diode, Signal, BAS316.	3198 010 10630	
6538	Diode, Signal, BAS316.	3198 010 10630	
6614	Diode, Signal, BAT51, SOD323	3198 010 10660	
6615	Diode, Signal, BAS316.	3198 010 10630	
6616	Diode, Signal, BAS316.	3198 010 10630	
6617	Diode, Signal, BAS316.	3198 010 10630	
6618	Diode, Signal, BAS316.	3198 010 10630	
6619	Diode, Rect, RGP10D	9337 516 60673	
6620	Diode, Rect, BYV27-200.	9335 526 80133	
6621	Diode, Rect, RGP10D	9337 516 60673	
6623	Diode, Signal, BAS316.	3198 010 10630	
6624	Diode, Signal, BAS316.	3198 010 10630	
6625	Diode, Signal, BAS316.	3198 010 10630	
6626	Diode, Signal, BAS316.	3198 010 10630	
6627	Diode, Signal, BAS316.	3198 010 10630	
6901	Zener Diode, 6.8 volt.	3198 020 56880	
7100	Transistor, PNP, BC557B.	3198 020 40110	
7101	Transistor, NPN, BC337-25.	3198 020 43530	
7102	FET Power, FQPF3N60	9322 160 34687	
S 7103	Optical Coupler, TCET1102(G)	9322 149 04682	
7120	Transistor, NPN, BC847B.	3198 010 42030	
7130	Transistor, NPN, BC847B.	3198 010 42030	
7131	F.E.T., STP16NF06FP.	9322 186 61687	
7132	Transistor, NPN, BC847B.	3198 010 42030	
7133	Transistor, PNP, BC857B.	3198 010 42150	
7140	Transistor, NPN, BC847B.	3198 010 42030	
7141	F.E.T., STP16NF06FP.	9322 186 61687	
7407	Transistor, NPN, BC847B.	9335 895 90215	
7408	Transistor, NPN, BC368	9332 592 40126	
7409	Transistor, NPN, BC847B.	3198 010 42030	
7421	Transistor, POW, BU2520DX.	9340 210 30127	
7440	IC, LM358N	9339 848 90682	
7441	Transistor, PNP, BC857B.	3198 010 42150	
7442	Transistor, PNP, BC857B.	3198 010 42150	
7443	Transistor, NPN, BC847B.	3198 010 42030	
7445	Transistor, NPN, BC847B.	3198 010 42030	
7450	IC, SM LM393D.	3198 010 70580	
7455	Transistor, NPN, PMBT2369.	3198 010 43360	
7480	FET Power, FQPF3N60	9322 160 34687	
S 7482	Optical Coupler, TCDT1102G	9319 002 76682	
7486	Transistor, NPN, BC847B.	3198 010 42030	
7487	Transistor, NPN, BC847B.	3198 010 42030	
7501	Transistor, NPN, BC847B.	3198 010 42030	
7502	Transistor, NPN, BC337-25.	3198 020 43530	
7503	Thyrister, BT151X-650R	9340 380 60127	
7504	F.E.T., STP11NM60.	9322 171 30687	
7505	Transistor, PNP, BC857B.	3198 010 42150	
7506	IC, TL431ACZ	3198 010 70500	
S 7507	Optical Coupler, TCET1102(G)	9322 149 04682	
7508	Transistor, PNP, BF423	3198 020 43020	
7528	Transistor, NPN, BC337-25.	3198 020 43530	
7529	Transistor, NPN, BC546B.	9332 377 80126	
7530	Transistor, NPN, BC847B.	3198 010 42030	
7611	Transistor, NPN, BC847B.	3198 010 42030	
7612	Transistor, NPN, BC847B.	3198 010 42030	
7613	IC, TL431CZ.	3198 010 70510	
7614	Transistor, NPN, BC847B.	3198 010 42030	
7620	IC, TDA8177.	9322 066 43687	
7641	Transistor, NPN, BC847B.	3198 010 42030	
7652	Transistor, NPN, BC847B.	3198 010 42030	
7653	Transistor, NPN, BC847B.	3198 010 42030	
7654	Transistor, PNP, BC857B.	3198 010 42150	
7680	IC, TDA7052/N2	9351 648 00112	
7681	Transistor, NPN, BC847B.	3198 010 42030	
7682	Transistor, NPN, BC368	9332 592 40126	
7701	IC, TDA7495S	9322 166 94682	
7710	Transistor, NPN, BC847B.	3198 010 42030	
7711	Transistor, NPN, BC847B.	3198 010 42030	
7901	Transistor, NPN, BC847B.	3198 010 42030	
7902	Transistor, NPN, BC847B.	3198 010 42030	
7910	IC, LD1086V33.	9322 152 53687	
7912	IC, MC78M05CT.	9334 703 90687	
9101	Wire Jumper, 0.58MM.	3198 036 90010	
9102	Wire Jumper, 0.58MM.	3198 036 90010	
9103	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9107	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9108	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9111	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9114	Wire Jumper, 0.58MM.	3198 036 90010	
9117	Wire Jumper, 0.58MM.	3198 036 90010	
9118	Wire Jumper, 0.58MM.	3198 036 90010	
9119	Wire Jumper, 0.58MM.	3198 036 90010	
9120	Wire Jumper, 0.58MM.	3198 036 90010	
9121	Wire Jumper, 0.58MM.	3198 036 90010	
9122	Wire Jumper, 0.58MM.	3198 036 90010	
9124	Wire Jumper, 0.58MM.	3198 036 90010	
9125	Wire Jumper, 0.58MM.	3198 036 90010	
9126	Wire Jumper, 0.58MM.	3198 036 90010	
9127	Wire Jumper, 0.58MM.	3198 036 90010	
9129	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9130	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9200	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9201	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9202	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9203	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9204	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9207	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9208	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9209	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9211	Res, Zero ohm, "Chip" Jumper	3198 021 90030	

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9212	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9214	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9215	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9216	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9217	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9218	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9219	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9221	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9222	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9223	Wire Jumper, 0.58MM.	3198 036 90010
9224	Wire Jumper, 0.58MM.	3198 036 90010
9227	Wire Jumper, 0.58MM.	3198 036 90010
9228	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9229	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9250	Wire Jumper, 0.58MM.	3198 036 90010
9260	Wire Jumper, 0.58MM.	3198 036 90010
9261	Wire Jumper, 0.58MM.	3198 036 90010
9263	Wire Jumper, 0.58MM.	3198 036 90010
9264	Wire Jumper, 0.58MM.	3198 036 90010
9266	Wire Jumper, 0.58MM.	3198 036 90010
9267	Wire Jumper, 0.58MM.	3198 036 90010
9268	Wire Jumper, 0.58MM.	3198 036 90010
9269	Wire Jumper, 0.58MM.	3198 036 90010
9270	Wire Jumper, 0.58MM.	3198 036 90010
9271	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9272	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9273	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9274	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9275	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9276	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9277	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9278	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9279	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9280	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9281	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9282	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9283	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9284	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9285	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9288	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9289	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9291	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9292	Wire Jumper, 0.58MM.	3198 036 90010
9294	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9295	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9296	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9297	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9298	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9402	Wire Jumper, 0.58MM.	3198 036 90010
9403	Wire Jumper, 0.58MM.	3198 036 90010
9404	Wire Jumper, 0.58MM.	3198 036 90010
9406	Wire Jumper, 0.58MM.	3198 036 90010
9408	Wire Jumper, 0.58MM.	3198 036 90010
9409	Wire Jumper, 0.58MM.	3198 036 90010
9411	Wire Jumper, 0.58MM.	3198 036 90010
9412	Wire Jumper, 0.58MM.	3198 036 90010
9413	Wire Jumper, 0.58MM.	3198 036 90010
9414	Wire Jumper, 0.58MM.	3198 036 90010
9415	Wire Jumper, 0.58MM.	3198 036 90010
9418	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9421	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9422	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9424	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9427	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9428	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9429	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9430	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9431	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9432	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9433	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9434	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9435	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9436	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9437	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9438	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9440	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9441	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9443	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9481	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9483	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9484	Wire Jumper, 0.58MM.	3198 036 90010
9499	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9501	Wire Jumper, 0.58MM.	3198 036 90010
9502	Wire Jumper, 0.58MM.	3198 036 90010
9508	Wire Jumper, 0.58MM.	3198 036 90010
9509	Wire Jumper, 0.58MM.	3198 036 90010
9511	Wire Jumper, 0.58MM.	3198 036 90010
9517	Wire Jumper, 0.58MM.	3198 036 90010
9518	Wire Jumper, 0.58MM.	3198 036 90010
9551	Wire Jumper, 0.58MM.	3198 036 90010
9552	Wire Jumper, 0.58MM.	3198 036 90010
9554	Wire Jumper, 0.58MM.	3198 036 90010
9556	Wire Jumper, 0.58MM.	3198 036 90010
9557	Wire Jumper, 0.58MM.	3198 036 90010
9558	Wire Jumper, 0.58MM.	3198 036 90010
9560	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9561	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9563	Wire Jumper, 0.58MM.	3198 036 90010
9564	Wire Jumper, 0.58MM.	3198 036 90010
9565	Wire Jumper, 0.58MM.	3198 036 90010
9566	Wire Jumper, 0.58MM.	3198 036 90010
9567	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9570	Wire Jumper, 0.58MM.	3198 036 90010
9571	Wire Jumper, 0.58MM.	3198 036 90010
9572	Wire Jumper, 0.58MM.	3198 036 90010
9621	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9622	Wire Jumper, 0.58MM.	3198 036 90010
9624	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9650	Wire Jumper, 0.58MM.	3198 036 90010
9652	Wire Jumper, 0.58MM.	3198 036 90010
9655	Wire Jumper, 0.58MM.	3198 036 90010
9656	Wire Jumper, 0.58MM.	3198 036 90010
9658	Wire Jumper, 0.58MM.	3198 036 90010
9659	Wire Jumper, 0.58MM.	3198 036 90010
9660	Wire Jumper, 0.58MM.	3198 036 90010
9661	Wire Jumper, 0.58MM.	3198 036 90010
9663	Wire Jumper, 0.58MM.	3198 036 90010
9664	Wire Jumper, 0.58MM.	3198 036 90010
9665	Wire Jumper, 0.58MM.	3198 036 90010
9666	Wire Jumper, 0.58MM.	3198 036 90010
9667	Wire Jumper, 0.58MM.	3198 036 90010
9669	Wire Jumper, 0.58MM.	3198 036 90010
9670	Wire Jumper, 0.58MM.	3198 036 90010
9671	Wire Jumper, 0.58MM.	3198 036 90010
9674	Wire Jumper, 0.58MM.	3198 036 90010
9675	Wire Jumper, 0.58MM.	3198 036 90010
9676	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9677	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9678	Wire Jumper, 0.58MM.	3198 036 90010
9700	Wire Jumper, 0.58MM.	3198 036 90010
9701	Wire Jumper, 0.58MM.	3198 036 90010
9703	Wire Jumper, 0.58MM.	3198 036 90010
9704	Wire Jumper, 0.58MM.	3198 036 90010
9705	Wire Jumper, 0.58MM.	3198 036 90010
9706	Wire Jumper, 0.58MM.	3198 036 90010
9707	Wire Jumper, 0.58MM.	3198 036 90010
9708	Wire Jumper, 0.58MM.	3198 036 90010
9709	Wire Jumper, 0.58MM.	3198 036 90010
9711	Wire Jumper, 0.58MM.	3198 036 90010
9713	Wire Jumper, 0.58MM.	3198 036 90010
9714	Wire Jumper, 0.58MM.	3198 036 90010
9717	Wire Jumper, 0.58MM.	3198 036 90010
9718	Wire Jumper, 0.58MM.	3198 036 90010
9719	Wire Jumper, 0.58MM.	3198 036 90010
9909	Wire Jumper, 0.58MM.	3198 036 90010
9910	Wire Jumper, 0.58MM.	3198 036 90010
9911	Wire Jumper, 0.58MM.	3198 036 90010
9912	Wire Jumper, 0.58MM.	3198 036 90010
9913	Wire Jumper, 0.58MM.	3198 036 90010
9914	Wire Jumper, 0.58MM.	3198 036 90010
9915	Wire Jumper, 0.58MM.	3198 036 90010
9916	Wire Jumper, 0.58MM.	3198 036 90010
9917	Wire Jumper, 0.58MM.	3198 036 90010
9918	Wire Jumper, 0.58MM.	3198 036 90010
9919	Wire Jumper, 0.58MM.	3198 036 90010
9920	Wire Jumper, 0.58MM.	3198 036 90010
9921	Wire Jumper, 0.58MM.	3198 036 90010
9922	Wire Jumper, 0.58MM.	3198 036 90010
9923	Wire Jumper, 0.58MM.	3198 036 90010
9924	Wire Jumper, 0.58MM.	3198 036 90010
9926	Wire Jumper, 0.58MM.	3198 036 90010
9927	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9928	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9929	Wire Jumper, 0.58MM.	3198 036 90010
9930	Wire Jumper, 0.58MM.	3198 036 90010
9931	Wire Jumper, 0.58MM.	3198 036 90010
9932	Wire Jumper, 0.58MM.	3198 036 90010
9933	Wire Jumper, 0.58MM.	3198 036 90010
9934	Wire Jumper, 0.58MM.	3198 036 90010
9935	Wire Jumper, 0.58MM.	3198 036 90010
9936	Wire Jumper, 0.58MM.	3198 036 90010
9937	Wire Jumper, 0.58MM.	3198 036 90010
9938	Wire Jumper, 0.58MM.	3198 036 90010
9939	Wire Jumper, 0.58MM.	3198 036 90010
9940	Wire Jumper, 0.58MM.	3198 036 90010
9942	Wire Jumper, 0.58MM.	3198 036 90010
9943	Wire Jumper, 0.58MM.	3198 036 90010
9944	Wire Jumper, 0.58MM.	3198 036 90010
9945	Wire Jumper, 0.58MM.	3198 036 90010
9946	Wire Jumper, 0.58MM.	3198 036 90010
9947	Wire Jumper, 0.58MM.	3198 036 90010
9948	Wire Jumper, 0.58MM.	3198 036 90010
9949	Wire Jumper, 0.58MM.	3198 036 90010
9950	Wire Jumper, 0.58MM.	3198 036 90010

S = Safety Part Be sure to use exact replacement part.

9951	Wire Jumper, 0.58MM.	3198 036 90010	
9952	Wire Jumper, 0.58MM.	3198 036 90010	
9953	Wire Jumper, 0.58MM.	3198 036 90010	
9954	Wire Jumper, 0.58MM.	3198 036 90010	
9955	Wire Jumper, 0.58MM.	3198 036 90010	
9956	Wire Jumper, 0.58MM.	3198 036 90010	
9957	Wire Jumper, 0.58MM.	3198 036 90010	
9958	Wire Jumper, 0.58MM.	3198 036 90010	
9959	Wire Jumper, 0.58MM.	3198 036 90010	
9960	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9961	Wire Jumper, 0.58MM.	3198 036 90010	
9962	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9963	Wire Jumper, 0.58MM.	3198 036 90010	
9964	Wire Jumper, 0.58MM.	3198 036 90010	
9965	Wire Jumper, 0.58MM.	3198 036 90010	
9966	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9967	Wire Jumper, 0.58MM.	3198 036 90010	
9968	Wire Jumper, 0.58MM.	3198 036 90010	
9969	Wire Jumper, 0.58MM.	3198 036 90010	
9970	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9971	Wire Jumper, 0.58MM.	3198 036 90010	
9972	Wire Jumper, 0.58MM.	3198 036 90010	
9974	Wire Jumper, 0.58MM.	3198 036 90010	
9975	Wire Jumper, 0.58MM.	3198 036 90010	
9976	Wire Jumper, 0.58MM.	3198 036 90010	
9977	Wire Jumper, 0.58MM.	3198 036 90010	
9978	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9979	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9981	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9982	Wire Jumper, 0.58MM.	3198 036 90010	
9985	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
9986	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9988	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9989	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9990	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9991	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9992	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9993	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9994	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9996	Wire Jumper, 0.58MM.	3198 036 90010	
9997	Res, Zero ohm, "Chip" Jumper	3198 021 90020	
9998	Res, Zero ohm, "Chip" Jumper	3198 021 90020	

CRT Panel

	CRT Panel		
CBA	CRT Panel.	3139 188 63021	
0031	Heatsink	3104 301 62294	
0032	IC-Spring.	3104 301 22081	
0033	Heatsink	3104 301 62294	
0034	IC-Spring.	3104 301 22081	
0035	Heatsink	3104 301 62294	
0036	IC-Spring.	3104 301 22081	
0100	PROCESS BOX PCB PNL.	3139 129 70451	
1298	CRT Socket, 10 Pin	2422 500 80063	
1424	Connector, 7 Pin	2422 025 11244	
1434	Connector, 1 Pin	2422 015 18552	
1483	Connector, 3 Pin	2422 025 16382	
1940	Connector, 11 Pin.	2422 025 12485	
2312	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040	
2313	Cap, 47u, 20%, 250v, Electrolytic. . .	2020 012 93786	
2318	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230	
2319	Cap, 10n, +80/-20%, 50v, Ceramic . . .	3198 019 21030	
2324	Cap, 1n5, 5%, 2000v, Polypropylene . .	2222 375 90266	
2338	Cap, 100n, 10%, 250v, Metalized Polyest er.	2020 308 90143	
2339	Cap, 100n, 10%, 250v, Metalized Polyest er.	2020 308 90143	
2340	Cap, 100n, 10%, 250v, Metalized Polyest er.	2020 308 90143	
2341	Cap, 100n, +80/-20%, 25v, Ceramic. . .	3198 023 41040	
2347	Cap, 470u, 20%, 16v, Electrolytic. . .	3198 025 24710	
2348	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030	
2358	Cap, 470u, 20%, 16v, Electrolytic. . .	3198 025 24710	
2359	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030	
2408	Cap, 3n3, 10%, 50v, Ceramic.	3198 017 33320	
2409	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030	
2411	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230	
2420	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220	
2427	Cap, 1n, 10%, 50v, Ceramic	3198 017 31020	
2428	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220	
2436	Cap, 22u, 20%, 100v, Electrolytic. . .	3198 025 72290	
2437	Cap, 1n, 10%, 50v, Ceramic	3198 017 31020	
2438	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220	
2439	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 32220	
2510	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040	
2511	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040	
3301	Res, 6K8, 5%, 5W, Metal Film	2322 257 41682	
3304	Res, 100 ohm, 5%, 1/3W, Metal Film . .	2306 204 03101	
S 3305	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108	
3310	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820	
3334	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	
3338	Res, 470 ohm, 20%, 1/2W, Carbon Film .	3198 013 04710	
3339	Res, 470 ohm, 20%, 1/2W, Carbon Film .	3198 013 04710	
3340	Res, 470 ohm, 20%, 1/2W, Carbon Film .	3198 013 04710	
3341	Res, 47 ohm, 5%, 1/2W, Metal Film. . .	2306 207 03479	
3345	Res, 33 ohm, 5%, 1/6W, Carbon Film . .	3198 011 03390	
3347	Res, 1K5, 20%, 1/2W, Carbon Film . . .	3198 013 01520	
S 3348	VDR, DC, 1mA, 50V, MAX 115V	2322 593 13507	
3349	Res, 1K, 20%, 1/2W, Carbon Film. . . .	3198 013 01020	
3350	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010	
3351	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010	
3352	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010	
3356	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820	
3401	Res, 100 ohm, 5%, 1 1/3W, Metal Film .	3198 012 21010	
3402	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090	
S 3403	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108	
S 3404	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306 204 03108	
3410	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210	
3411	Res, 100K, 5%, 1/16W, Metalized Glass.	3198 021 31040	
3412	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
3413	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210	
3416	Res, 100K, 5%, 1/16W, Metalized Glass.	3198 021 31040	
3417	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
3422	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
3423	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
3424	Res, 2M2, 5%, 1/16W, Metalized Glass .	3198 021 32250	
3425	Res, 2M2, 5%, 1/16W, Metalized Glass .	3198 021 32250	
3426	Res, 2M2, 5%, 1/16W, Metalized Glass .	3198 021 32250	
3427	Res, 2M2, 5%, 1/16W, Metalized Glass .	3198 021 32250	
3429	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3448	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210	
3449	Res, 39 ohm, 5%, 1/16W, Metalized Glass	2322 702 60399	
3450	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3451	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790	
3452	Res, 39K, 5%, 1/16W, Metalized Glass .	3198 021 33930	
3453	Res, 3K9, 5%, 1/16W, Metalized Glass .	3198 021 33920	
3454	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210	
3455	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720	
3456	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	
3458	Res, 39 ohm, 5%, 1/16W, Metalized Glass	2322 702 60399	
3460	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	
3470	Res, 1 ohm, 5%, 1/6W, Carbon Film. . .	3198 011 01080	
3471	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	
3472	Res, 1 ohm, 5%, 1/6W, Carbon Film. . .	3198 011 01080	
3473	Res, 1 ohm, 5%, 1/6W, Carbon Film. . .	3198 011 01080	
3474	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3477	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090	
3478	Res, 1 ohm, 5%, 1/6W, Carbon Film. . .	3198 011 01080	
3488	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090	
3510	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210	
3517	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020	
3520	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210	
3530	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210	
3544	Res, 470K, 5%, 1/6W, Carbon Film . . .	3198 011 04740	
3999	Res, 8K2, 5%, 1/16W, Metalized Glass .	3198 021 38220	
4501	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4502	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4503	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4504	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4505	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4506	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4507	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4508	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
4509	Res, Zero ohm, "Chip" Jumper	3198 021 90030	
S 5300	Transfromer, S13974-03 Y	3104 308 20571	
5303	Wire Jumper, 0.58MM.	3198 036 90010	
5304	Fixed, Inductor, 100MHz, 50R.	3198 018 90010	
5308	Coil, 5u6.	3198 018 15680	
5309	Coil, 5u6.	3198 018 15680	
5310	Coil, 100u	3198 018 21010	
5400	Coil, 33u.	3198 018 73390	
6301	Diode, Signal, BAS321.	9340 553 52115	
6302	Diode, Signal, BAS321.	9340 553 52115	
6303	Diode, Signal, BAS321.	9340 553 52115	
6305	Diode, Signal, BAS321.	9340 553 52115	
6306	Diode, Signal, BAS321.	9340 553 52115	
6307	Diode, Signal, BAS321.	9340 553 52115	
6401	Diode, Signal, BAS316.	3198 010 10630	
6402	Diode, Signal, BAS316.	3198 010 10630	
6403	Diode, Signal, BAS316.	3198 010 10630	
6404	Diode, Signal, BAS316.	3198 010 10630	
6408	Res, 100 ohm, 5%, 1/10W, Glass	3198 021 51010	
6409	Diode, Signal, BAS316.	3198 010 10630	
6410	Res, 100 ohm, 5%, 1/10W, Glass	3198 021 51010	
6411	Diode, Signal, BAS316.	3198 010 10630	
6420	Diode, Signal, BAV99	3198 010 10620	
6421	Diode, Signal, BAV99	3198 010 10620	
6422	Diode, Signal, BAV99	3198 010 10620	
6426	Diode, Signal, BAW62	9331 012 20133	
6427	Diode, Signal, BAW63	9331 012 20133	
6428	Diode, Signal, BAW64	9331 012 20133	
6430	Zener Diode, 12 volt	3198 020 51290	
6431	Diode, Signal, BAS316.	3198 010 10630	
6500	Diode, Signal, BAS316.	3198 010 10630	

S = Safety Part Be sure to use exact replacement part.

6501	Diode, Signal, BAS316.	3198 010 10630
6502	Diode, Signal, BAS316.	3198 010 10630
7330	IC, TDA6118JF/N1	9352 694 46112
7340	IC, TDA6118JF/N1	9352 694 46112
7350	IC, TDA6118JF/N1	9352 694 46112
7414	Transistor, PNP, BCP53	9322 148 71685
7415	Transistor, NPN, BCP56	9322 169 63685
7422	Transistor, NPN, BFS20	9330 921 11215
7423	Transistor, NPN, BC847B.	3198 010 42030
7425	Transistor, NPN, BFS20	9330 921 11215
7426	Transistor, PNP, BC857B.	3198 010 42150
7427	Transistor, NPN, BC847B.	3198 010 42030
7428	Transistor, PNP, BC857B.	3198 010 42150
7429	Transistor, NPN, BCP56	9322 169 63685
7430	Transistor, PNP, BCP53	9322 148 71685
7431	Transistor, PNP, BF824	9337 223 50215
7432	Transistor, NPN, BFS20	9330 921 11215
9301	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9303	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9305	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9306	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9308	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9314	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9401	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9402	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9403	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9416	Wire Jumper, 0.58MM.	3198 036 90010
9417	Wire Jumper, 0.58MM.	3198 036 90010
9418	Wire Jumper, 0.58MM.	3198 036 90010
9419	Wire Jumper, 0.58MM.	3198 036 90010
9423	Wire Jumper, 0.58MM.	3198 036 90010
9424	Wire Jumper, 0.58MM.	3198 036 90010
9427	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9428	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9430	Wire Jumper, 0.58MM.	3198 036 90010
9431	Wire Jumper, 0.58MM.	3198 036 90010
9432	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9433	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9435	Wire Jumper, 0.58MM.	3198 036 90010
9436	Wire Jumper, 0.58MM.	3198 036 90010
9437	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9450	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9451	Wire Jumper, 0.58MM.	3198 036 90010
9452	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9453	Res, Zero ohm, "Chip" Jumper	3198 021 90020
9501	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9502	Res, Zero ohm, "Chip" Jumper	3198 021 90030
9503	Res, Zero ohm, "Chip" Jumper	3198 021 90030

Small Signal Board

	Small Signal Board	
CBA	Small Signal Board	3139 188 55321
1113	Filter, S.A.W. 45Mhz75	2422 549 44377
1116	Connector, 7 Pin	2422 025 17779
1117	Connector, 11 Pin.	2422 025 17513
1581	Crystal Resonator, 13MHz5.	2422 543 01246
2002	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2003	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2005	Cap, 1n, 50v, Ceramic.	3198 035 01020
2006	Cap, 1n, 50v, Ceramic.	3198 035 01020
2008	Cap, 1n, 50v, Ceramic.	3198 035 01020
2012	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2013	Cap, 470p, 50v, Ceramic.	3198 035 04710
2014	Cap, 100n, 16v, Ceramic.	3198 035 71040
2015	Cap, 470p, 50v, Ceramic.	3198 035 04710
2016	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2018	Cap, 470p, 50v, Ceramic.	3198 035 04710
2019	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2021	Cap, 470p, 50v, Ceramic.	3198 035 04710
2022	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2024	Cap, 470p, 50v, Ceramic.	3198 035 04710
2025	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2027	Cap, 470p, 50v, Ceramic.	3198 035 04710
2028	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2030	Cap, 1n, 50v, Ceramic.	3198 035 01020
2031	Cap, 1n, 50v, Ceramic.	3198 035 01020
2032	Cap, 1n, 50v, Ceramic.	3198 035 01020
2033	Cap, 1n, 50v, Ceramic.	3198 035 01020
2041	Cap, 1n, 50v, Ceramic.	3198 035 01020
2042	Cap, 1n, 50v, Ceramic.	3198 035 01020
2043	Cap, 1n, 50v, Ceramic.	3198 035 01020
2044	Cap, 1n, 50v, Ceramic.	3198 035 01020
2045	Cap, 2u2, 20%, 50v, Electrolytic . . .	3198 030 82280
2046	Cap, 22u, 20%, 16v, Electrolytic . . .	3198 030 42290
2047	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2048	Cap, 100n, 16v, Ceramic.	3198 035 71040
2049	Cap, 100n, 16v, Ceramic.	3198 035 71040
2050	Cap, 100n, 16v, Ceramic.	3198 035 71040
2051	Cap, 100n, 16v, Ceramic.	3198 035 71040
2060	Cap, 100n, 16v, Ceramic.	3198 035 71040
2062	Cap, 100n, 16v, Ceramic.	3198 035 71040
2063	Cap, 100n, 16v, Ceramic.	3198 035 71040
2065	Cap, 100n, 16v, Ceramic.	3198 035 71040
2066	Cap, 100n, 16v, Ceramic.	3198 035 71040
2067	Cap, 100n, 16v, Ceramic.	3198 035 71040
2068	Cap, 100n, 16v, Ceramic.	3198 035 71040
2071	Cap, 100n, 16v, Ceramic.	3198 035 71040
2072	Cap, 100n, 16v, Ceramic.	3198 035 71040
2073	Cap, 100n, 16v, Ceramic.	3198 035 71040
2074	Cap, 100n, 16v, Ceramic.	3198 035 71040
2075	Cap, 100n, 16v, Ceramic.	3198 035 71040
2076	Cap, 100n, 16v, Ceramic.	3198 035 71040
2078	Cap, 100n, 16v, Ceramic.	3198 035 71040
2079	Cap, 100n, 16v, Ceramic.	3198 035 71040
2081	Cap, 100n, 16v, Ceramic.	3198 035 71040
2082	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2083	Cap, 100n, 16v, Ceramic.	3198 035 71040
2084	Cap, 100n, 16v, Ceramic.	3198 035 71040
2085	Cap, 100n, 16v, Ceramic.	3198 035 71040
2086	Cap, 100n, 16v, Ceramic.	3198 035 71040
2101	Cap, 10n, 16v, Ceramic	3198 035 71030
2102	Cap, 10n, 16v, Ceramic	3198 035 71030
2119	Cap, 10n, 16v, Ceramic	3198 035 71030
2126	Cap, 100p, 50v, Ceramic.	3198 034 01010
2127	Cap, 100n, 16v, Ceramic.	3198 035 71040
2128	Cap, 2u2, 20%, 50v, Electrolytic . . .	3198 030 82280
2130	Cap, 10n, 16v, Ceramic	3198 035 71030
2134	Cap, 100n, 16v, Ceramic.	3198 035 71040
2135	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2136	Cap, 2u2, 20%, 50v, Electrolytic . . .	3198 030 82280
2137	Cap, 100u, 20%, 16v, Electrolytic. . .	3198 030 41010
2138	Cap, 100n, 16v, Ceramic.	3198 035 71040
2150	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2151	Cap, 2u2, 20%, 50v, Electrolytic . . .	3198 030 82280
2152	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2154	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2155	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2156	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2157	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2281	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2282	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2284	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2285	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2300	Cap, 100n, 16v, Ceramic.	3198 035 71040
2305	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198 017 41050
2307	Cap, 100p, 50v, Ceramic.	3198 034 01010
2308	Cap, 100p, 50v, Ceramic.	3198 034 01010
2310	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2311	Cap, 10n, 16v, Ceramic	3198 035 71030
2317	Cap, 100p, 50v, Ceramic.	3198 034 01010
2318	Cap, 100p, 50v, Ceramic.	3198 034 01010
2321	Cap, 10n, 16v, Ceramic	3198 035 71030
2324	Cap, 100p, 50v, Ceramic.	3198 034 01010
2325	Cap, 82p, 50v, Ceramic	3198 034 08290
2327	Cap, 100p, 50v, Ceramic.	3198 034 01010
2328	Cap, 100p, 50v, Ceramic.	3198 034 01010
2331	Cap, 10n, 16v, Ceramic	3198 035 71030
2341	Cap, 100n, 16v, Ceramic.	3198 035 71040
2342	Cap, 100n, 16v, Ceramic.	3198 035 71040
2343	Cap, 100n, 16v, Ceramic.	3198 035 71040
2344	Cap, 100n, 16v, Ceramic.	3198 035 71040
2345	Cap, 100n, 16v, Ceramic.	3198 035 71040
2346	Cap, 100n, 16v, Ceramic.	3198 035 71040
2350	Cap, 100u, 20%, 16v, Electrolytic. . .	3198 030 41010
2351	Cap, 10p, 50v, Ceramic	3198 034 01090
2352	Cap, 10p, 50v, Ceramic	3198 034 01090
2358	Cap, 100p, 50v, Ceramic.	3198 034 01010
2359	Cap, 100n, 16v, Ceramic.	3198 035 71040
2360	Cap, 100p, 50v, Ceramic.	3198 034 01010
2361	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2363	Cap, 100p, 50v, Ceramic.	3198 034 01010
2365	Cap, 100p, 50v, Ceramic.	3198 034 01010
2366	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2371	Cap, 1n, 50v, Ceramic.	3198 035 01020
2372	Cap, 1n, 50v, Ceramic.	3198 035 01020
2377	Cap, 2n2, 50v, Ceramic	3198 035 02220
2379	Cap, 2n2, 50v, Ceramic	3198 035 02220
2380	Cap, 470p, 50v, Ceramic.	3198 035 04710
2384	Cap, 1n, 50v, Ceramic.	3198 035 01020
2386	Cap, 10p, 50v, Ceramic	3198 034 01090
2395	Cap, 10n, 16v, Ceramic	3198 035 71030
2397	Cap, 100n, 16v, Ceramic.	3198 035 71040
2432	Cap, 4n7, 50v, Ceramic	2020 552 96793
2433	Cap, 4n7, 50v, Ceramic	2020 552 96793
2434	Res, Zero ohm, "Chip" Jumper	3198 021 90030
2435	Res, Zero ohm, "Chip" Jumper	3198 021 90030
2438	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2439	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2440	Cap, 1n, 50v, Ceramic.	3198 035 01020
2441	Cap, 1n, 50v, Ceramic.	3198 035 01020
2442	Cap, 1n, 50v, Ceramic.	3198 035 01020
2443	Cap, 1n, 50v, Ceramic.	3198 035 01020
2444	Cap, 1n, 50v, Ceramic.	3198 035 01020
2445	Cap, 1n, 50v, Ceramic.	3198 035 01020

S = Safety Part Be sure to use exact replacement part.

2447	Cap, 100u, 20%, 16v, Electrolytic. . .	3198 030 41010
2450	Cap, 10n, 16v, Ceramic	3198 035 71030
2452	Cap, 10n, 16v, Ceramic	3198 035 71030
2461	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2462	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2480	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2481	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198 017 44740
2483	Cap, 1n, 50v, Ceramic.	3198 035 01020
2484	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2485	Cap, 1n, 50v, Ceramic.	3198 035 01020
2486	Cap, 100n, 16v, Ceramic.	3198 035 71040
2487	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2488	Cap, 100u, 20%, 16v, Electrolytic. . .	3198 030 41010
2489	Cap, 100u, 20%, 16v, Electrolytic. . .	3198 030 41010
2514	Cap, 18p, 50v, Ceramic	3198 034 01890
2516	Cap, 18p, 50v, Ceramic	3198 034 01890
2525	Cap, 100n, 16v, Ceramic.	3198 035 71040
2546	Cap, 100n, 16v, Ceramic.	3198 035 71040
2557	Cap, 100p, 50v, Ceramic.	3198 034 01010
2571	Cap, 100n, 16v, Ceramic.	3198 035 71040
2581	Cap, 22p, 50v, Ceramic	3198 034 02290
2582	Cap, 22p, 50v, Ceramic	3198 034 02290
2583	Cap, 100n, 16v, Ceramic.	3198 035 71040
2584	Cap, 100n, 16v, Ceramic.	3198 035 71040
2600	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2601	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2604	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2607	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2609	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2611	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2612	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2615	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2618	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2620	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2622	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2623	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2628	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2629	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2630	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2633	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2634	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2638	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2644	Cap, 22u, 20%, 16v, Electrolytic . . .	3198 030 42290
2645	Cap, 10u, 20%, 16v, Electrolytic . . .	3198 030 41090
2651	Cap, 100u, 20%, 6.3v, Electrolytic . .	2020 021 91679
2652	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2654	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2655	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2656	Cap, 100n, +80/-20%, 16v, Ceramic. . .	2238 787 19849
2657	Cap, 100p, 5%, 50v, Ceramic.	2238 869 15101
2659	Cap, 220n, +80/-20%, 16v, Ceramic. . .	3198 017 42240
2730	Cap, 100n, 16v, Ceramic.	3198 035 71040
2731	Cap, 100n, 16v, Ceramic.	3198 035 71040
2732	Cap, 100n, 16v, Ceramic.	3198 035 71040
2733	Cap, 100n, 16v, Ceramic.	3198 035 71040
2734	Cap, 100n, 16v, Ceramic.	3198 035 71040
2792	Cap, 100n, 16v, Ceramic.	3198 035 71040
2793	Cap, 100n, 16v, Ceramic.	3198 035 71040
2904	Cap, 100p, 50v, Ceramic.	3198 034 01010
2918	Cap, 100p, 50v, Ceramic.	3198 034 01010
2919	Cap, 100p, 50v, Ceramic.	3198 034 01010
2932	Cap, 100p, 50v, Ceramic.	3198 034 01010
2933	Cap, 100p, 50v, Ceramic.	3198 034 01010
2935	Cap, 100p, 50v, Ceramic.	3198 034 01010
2936	Cap, 100p, 50v, Ceramic.	3198 034 01010
2938	Cap, 100p, 50v, Ceramic.	3198 034 01010
2948	Cap, 18p, 50v, Ceramic	3198 034 01890
2949	Cap, 18p, 50v, Ceramic	3198 034 01890
2950	Cap, 100p, 50v, Ceramic.	3198 034 01010
2951	Cap, 100p, 50v, Ceramic.	3198 034 01010
2962	Cap, 100p, 50v, Ceramic.	3198 034 01010
2967	Cap, 1n, 50v, Ceramic.	3198 035 01020
2968	Cap, 1n, 50v, Ceramic.	3198 035 01020
2975	Cap, 4n7, 50v, Ceramic	2020 552 96793
2976	Cap, 4n7, 50v, Ceramic	2020 552 96793
2977	Cap, 100p, 50v, Ceramic.	3198 034 01010
2978	Cap, 100p, 50v, Ceramic.	3198 034 01010
2979	Cap, 100n, 16v, Ceramic.	3198 035 71040
3002	Cap, 100p, 50v, Ceramic.	3198 034 01010
3003	Cap, 100p, 50v, Ceramic.	3198 034 01010
3004	Cap, 100p, 50v, Ceramic.	3198 034 01010
3005	Cap, 100p, 50v, Ceramic.	3198 034 01010
3006	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3007	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3008	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3009	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3010	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3011	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3012	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3013	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3018	Res, 4R7, 5%, 1/8W, Metalized Glass. .	2322 750 64708
3019	Res, 10 ohm, 5%, 1/8W, Metalized Glass	2322 750 61009
3028	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 031 03310
3029	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 031 03310
3060	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 031 02220
3062	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 031 01810
3063	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 031 02210
3066	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 031 02220
3067	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3072	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3073	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3074	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3103	Res, 6K8, 5%, 1/16W, Metalized Glass .	3198 031 06820
3104	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 031 02220
3131	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3132	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3138	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198 031 03910
3150	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 031 01820
3151	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3152	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 031 01820
3153	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3154	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3155	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 031 08210
3281	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3282	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3283	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3284	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3302	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3303	Res, 6K8, 5%, 1/16W, Metalized Glass .	3198 031 06820
3304	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 031 03310
3305	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3306	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3307	Res, 18 ohm, 5%, 1/16W, Metalized Glass	2322 705 87189
3309	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
3310	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3311	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3312	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 031 08210
3313	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 031 02210
3316	Res, 18 ohm, 5%, 1/16W, Metalized Glass	2322 705 87189
3318	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3319	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
3320	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3321	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3322	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 031 08210
3323	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 031 02210
3326	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 031 04710
3329	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
3330	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3331	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3332	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 031 08210
3333	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 031 02210
3334	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3335	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3336	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3337	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3338	Res, 18 ohm, 5%, 1/16W, Metalized Glass	2322 705 87189
3340	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3343	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3345	Res, 6K8, 5%, 1/16W, Metalized Glass .	3198 031 06820
3346	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3347	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 031 02230
3348	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 031 02230
3349	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3350	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 031 02210
3351	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3352	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3353	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3354	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3355	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 031 02230
3356	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 031 08210
3357	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 031 02230
3358	Res, 10 ohm, 5%, 1/8W, Metalized Glass	2322 750 61009
3361	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3364	Res, 120K, 5%, 1/16W, Metalized Glass.	2322 705 70124
3365	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3366	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 031 02220
3367	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3368	Res, 68K, 5%, 1/16W, Metalized Glass .	3198 031 06830
3371	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3372	Res, 1.5 Meg, 5%, Metalized Glass. . .	2322 705 70155
3373	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3374	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3375	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3376	Res, 15K, 5%, 1/16W, Metalized Glass .	3198 031 01530
3377	Res, 1.2 Meg, 5%, Metalized Glass. . .	2322 705 70125
3378	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3380	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3382	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3384	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3385	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730
3386	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 031 02730
3390	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3391	Res, 39K, 5%, 1/16W, Metalized Glass .	3198 031 03930
3392	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 031 04730

S = Safety Part Be sure to use exact replacement part.

3393	Res, 3K3, 5%, 1/16W, Metalized Glass .	3198 031 03320
3395	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3396	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 031 04710
3397	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 031 04710
3398	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3480	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3481	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3482	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 031 04720
3483	Res, 8K2, 5%, 1/16W, Metalized Glass .	3198 031 08220
3484	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 031 04720
3485	Res, 8K2, 5%, 1/16W, Metalized Glass .	3198 031 08220
3501	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3502	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3503	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3507	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3508	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 031 04720
3509	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3510	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3511	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 031 04790
3512	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 031 04790
3513	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3514	Res, 1K2, 5%, 1/16W, Metalized Glass .	3198 031 01220
3515	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3523	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3547	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3550	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 031 04720
3557	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 031 04790
3561	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3563	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3564	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3565	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3570	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 031 02220
3571	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 031 02720
3572	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3573	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3581	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3582	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 031 01030
3583	Res, 18K, 5%, 1/16W, Metalized Glass .	3198 031 01830
3586	Res, 22K, 5%, 1/16W, Metalized Glass .	3198 031 02230
3590	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 031 01020
3651	Res, 1K2, 1%, 1/16W, Metalized Glass .	2322 704 61202
3652	Res, 2K7, 1%, 1/16W, Metalized Glass .	2322 704 62702
3737	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 031 03390
3901	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3902	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3903	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3909	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3911	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3918	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3919	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3928	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3929	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3936	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3938	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3950	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3951	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3962	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3963	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3964	Res, Zero ohm, "Chip" Jumper	3198 031 90010
3975	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3976	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3977	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3978	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3979	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3980	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
4062	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4101	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4104	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4363	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4430	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4431	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4450	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4451	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4452	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4560	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4571	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4573	Res, Zero ohm, "Chip" Jumper	3198 031 90010
4791	Res, Zero ohm, "Chip" Jumper	3198 031 90010
5060	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5061	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5063	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5101	Coil, 390n	3198 018 33970
5102	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5112	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5134	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5135	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5150	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5151	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5152	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5281	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5282	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5283	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5285	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5300	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5307	Res, Zero ohm, "Chip" Jumper	3198 021 90020
5317	Res, Zero ohm, "Chip" Jumper	3198 021 90020
5327	Res, Zero ohm, "Chip" Jumper	3198 021 90020
5328	Res, Zero ohm, "Chip" Jumper	3198 021 90020
5342	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5343	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5344	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5345	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5450	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5452	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5480	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5570	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5583	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5600	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5601	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5651	Coil, 10u.	2422 535 94134
5654	Coil, 1u	2422 535 95668
5659	Coil, 6u8.	3198 018 66880
5730	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5731	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
5792	Fixed Inductor, 100 MHz, 220 ohm . . .	2422 549 44197
6030	Diode, Signal, BAS316.	3198 010 10630
6301	Diode, Signal, BAS316.	3198 010 10630
6327	Zener Diode, 2.7 volt.	3198 020 52780
6341	Diode, Signal, BAS316.	3198 010 10630
6353	Diode, Signal, BAV99	3198 010 10620
6365	Diode, Signal, BAV99	3198 010 10620
6367	Zener Diode, 56 volt	9322 150 19685
6368	Diode, Signal, BAS316.	3198 010 10630
6369	Zener Diode, 56 volt	9322 150 19685
6381	Diode, Signal, BAV99	3198 010 10620
6382	Zener Diode, 47 volt	9340 389 00115
6384	Zener Diode, 22 volt	3198 020 52290
6385	Diode, Signal, BAS316.	3198 010 10630
6397	Zener Diode, 27 volt	3198 020 52790
6398	Diode, Signal, BAS316.	3198 010 10630
6480	Zener Diode, 12 volt	3198 020 51290
6481	Zener Diode, 12 volt	3198 020 51290
6651	Diode, Rect, SS14.	3198 010 10710
7029	Transistor, NPN, BC847BS	9340 425 20115
7060	Transistor, NPN, BC847BPN.	9340 425 30115
7063	Transistor, PNP, BC857B.	3198 010 42150
7100	IC, PNX3000HL/N2	9352 740 21557
7150	Transistor, NPN, BC847BS	9340 425 20115
7300	IC, PNX3002E/N302.	9352 735 54557
7301	Transistor, PNP, BC857B.	3198 010 42150
7302	Transistor, PNP, BC857B.	3198 010 42150
7303	Transistor, PNP, BC857B.	3198 010 42150
7304	Transistor, NPN, BC847BW	3198 010 42310
7310	Transistor, NPN, BC847BPN.	9340 425 30115
7320	Transistor, NPN, BC847BPN.	9340 425 30115
7330	Transistor, NPN, BC847BPN.	9340 425 30115
7346	Transistor, PNP, BC857B.	3198 010 42150
7356	Transistor, PNP, BC857B.	3198 010 42150
7365	Transistor, NPN, BC847B.	3198 010 42030
7382	Transistor, PNP, BC857B.	3198 010 42150
7383	Transistor, NPN, BC847BPN.	9340 425 30115
7393	Transistor, NPN, BC847BW	3198 010 42310
7480	IC, TDA1308T/N1.	9350 721 10115
7525	IC, SM M24C64-WMN6	9322 130 41668
7581	IC, NE56610-45GW	9352 691 56115
7650	IC, CS51033YDR8	9322 170 61668
7651	Power FET, STS5PF30L	9322 170 87668
7730	IC, MOD, Digital, SRAM	9322 166 67668
7790	IC, M58LW032C90N1	9322 199 76668

Side AV Panel

	Side AV Panel	
CBA	Side AV Panel.	3139 137 29041
0240	Connector, 11 Pin.	2422 025 12485
1254	Socket, Phone, 1 Pin	2422 026 04747
1255	Socket, Cinch, 3 Pin	2422 026 04815
1256	Socket, MDIN, 10 Pin	2422 026 04926
2286	Cap, 150p, 10%, 50v, Ceramic	3198 019 11510
2288	Cap, 150p, 10%, 50v, Ceramic	3198 019 11510
2292	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710
2294	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710
2296	Cap, 22n, +80/-20%, 50v, Ceramic . . .	3198 019 22230
2297	Cap, 22n, +80/-20%, 50v, Ceramic . . .	3198 019 22230
3285	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590
3286	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3287	Res, 75 ohm, 5%, 1/6W, Carbon Film . .	3198 011 07590
3288	Res, 10 ohm, 5%, 1/6W, Carbon Film . .	3198 011 01090
3289	Res, 1K8, 5%, 1/6W, Carbon Film. . . .	3198 011 01820
3291	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3292	Res, 47K, 5%, 1/10W, Metalized Glass .	3198 021 54730
3293	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3294	Res, 47K, 5%, 1/10W, Metalized Glass .	3198 021 54730
3295	Res, 3K9, 5%, 1/6W, Carbon Film. . . .	3198 011 03920
3296	Res, 10K, 5%, 1/10W, Metalized Glass .	3198 021 51030

S = Safety Part Be sure to use exact replacement part.

3297	Res, 10K, 5%, 1/10W, Metalized Glass .	3198 021 51030
4241	Res, Zero ohm, "Chip" Jumper	3198 021 90020
4243	Res, Zero ohm, "Chip" Jumper	3198 021 90020
6291	Zener Diode, 12 volt	3198 020 51290
6292	Zener Diode, 12 volt	3198 020 51290
6293	Zener Diode, 12 volt	3198 020 51290
6294	Zener Diode, 12 volt	3198 020 51290
6296	Zener Diode, 12 volt	3198 020 51290
6297	Zener Diode, 12 volt	3198 020 51290
9231	Wire Jumper, 0.58MM.	3198 036 90010
9232	Wire Jumper, 0.58MM.	3198 036 90010

Side IO Panel

Side IO Panel

Top Control Panel

Top Control Panel

CBA	Top Control Panel.	3139 137 25671
0080	Top control Assembly (Silver).	3139 138 11451
0215	Connector, 3 Pin	2422 025 09191
3091	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198 021 55610
3092	Res, 390 ohm, 5%, 1/10W, Metalized Glas	3198 021 53910
3093	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198 021 55610
3094	Res, 270 ohm, 5%, 1/10W, Metalized Glas	3198 021 52710
3095	Res, 3K3, 5%, 1/10W, Metalized Glass .	3198 021 53320
3096	Res, 1K5, 5%, 1/10W, Metalized Glass .	3198 021 51520
4089	Res, Zero ohm, "Chip" Jumper	3198 021 90020
4089	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4090	Res, Zero ohm, "Chip" Jumper	3198 021 90020
4090	Res, Zero ohm, "Chip" Jumper	3198 021 90030
6091	Diode, Signal, BAT254.	9340 393 00115

DAF Panel

DAF Panel

CBA	DAF Panel.	3104 328 26491
0034	DAF BRACKET EMGS	3104 304 23042
1057	DAF EMG/EMG STAR 28RF/32RF	3104 328 13672
1417	Connector, 2 Pin	2422 025 16269
1418	Connector, 2 Pin	2422 025 16374
1419	Connector, 2 Pin	2422 025 16269
1491	Wire, 1 Pin.	3104 311 02452
1497	Connector, 1 Pin	2422 015 18552
2800	Cap, 470p, 5%, 2000v, Polypropylene. .	2222 375 90498
2821	Cap, 68n, 5%, 400v, Metalized Polypropy lene	2222 479 90166
2890	Cap, 220p, 5%, 2000v, Polypropylene. .	2222 375 90276
3998	Res, 180 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01810
5800	Transformer, Signal, S21975-03 Y . . .	2422 531 02437
5801	Transformer, Signal, Correction, C948-0 2 Y.	2422 531 02435
5801	Transformer, Self Correction, -CU15 B.	3128 138 38881
9805	Wire Jumper, 0.58MM.	3198 036 90010

2FH Magnavox

2FH Magnavox

2FH-YPBR Panel

2FH-YPBR Panel

CBA	2FH-YPBR Panel	3139 188 60571
1021	Socket, 19 Pin	2422 033 00526
1071	Socket, 3 Pin.	2422 026 05079
1072	Socket, 2 Pin.	2422 026 04758
1073	Socket, 2 Pin.	2422 026 01999
1116	Connector, 7 Pin	2422 025 18446
1117	Connector, 11 Pin.	2422 025 16981
1951	Connector, 5 Pin	2422 025 06353
2000	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2001	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2002	Cap, 22u, 20%, 16v, Electrolytic . . .	3198 030 42290
2003	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2004	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2007	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198 017 41050
2008	Cap, 10n, +80/-20%, 50v, Ceramic . . .	2020 552 94729
2009	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2010	Cap, 100n, 16V, Ceramic.	3198 035 71040
2011	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2012	Cap, 100n, 16V, Ceramic.	3198 035 71040
2013	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198 017 41050
2014	Cap, 10n, +80/-20%, 50v, Ceramic . . .	2020 552 94729
2015	Cap, 100n, 16V, Ceramic.	3198 035 71040
2016	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2017	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2018	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2019	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2020	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2021	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2022	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
2023	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2025	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198 017 41050
2026	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730
2027	Cap, 10n, 10%, 50v, Ceramic.	3198 017 31030
2028	Cap, 10u, +80/-20%, 10v, Ceramic . . .	2020 552 96507
2030	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2031	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2032	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2033	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2034	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2035	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2036	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2037	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2039	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2040	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2041	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2042	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2043	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2044	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2045	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2046	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2047	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2048	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2049	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2050	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2051	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2052	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2053	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2054	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2055	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2057	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2059	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2060	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2061	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2069	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020
2071	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2073	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2075	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2077	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2079	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2081	Cap, 4u7, +80/-20%, 10v, Ceramic . . .	2020 552 96305
2083	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2084	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2085	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2086	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2087	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2088	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2089	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2090	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2091	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250
2092	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
2094	Cap, 220n, 10%, 10v, Ceramic	3198 017 32240
2095	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2096	Cap, 22u, 20%, 16v, Electrolytic . . .	3198 030 42290
2097	Cap, 47u, 20%, 6.3v, Electrolytic. . .	3198 030 24790
2098	Cap, 22u, 20%, 16v, Electrolytic . . .	3198 030 42290
3001	Res, 1M, 5%, 1/16W, Metalized Glass. .	3198 021 31050
3002	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3003	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
3004	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3005	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 021 33390
3007	Resistor Network, 4X 33 ohm, 5%. . . .	3198 031 13390
3008	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3009	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3010	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3011	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3012	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3013	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3014	Res, 3K9, 5%, 1/16W, Metalized Glass .	3198 021 33920
3015	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3016	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3017	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3018	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3019	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3020	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3026	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3027	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3030	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3031	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3032	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3033	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3034	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3035	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3036	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198 021 33910
3037	Res, 91 ohm, 1%, 1/16W, Metalized Glass	2322 704 69109
3040	Res, 1 ohm, 5%, 1/16W, Metalized Glass	3198 021 31080
3041	Res, 1 ohm, 5%, 1/16W, Metalized Glass	3198 021 31080
3042	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3043	Res, 220K, 5%, 1/16W, Metalized Glass.	3198 031 02240
3044	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 031 01010
3045	Res, 220K, 5%, 1/16W, Metalized Glass.	3198 031 02240
3071	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3074	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3077	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198 021 37590
3082	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3083	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3084	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010

3085	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3086	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3087	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3088	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3089	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3090	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3091	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3092	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3093	Res, 47K, 5%, 1/16W, Metalized Glass .	3198 021 34730
3094	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3095	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3096	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198 021 31020
3098	Res, 3R3, 5%, 1/8W, Metalized Glass. .	2322 750 63308
3099	Res, 3R3, 5%, 1/8W, Metalized Glass. .	2322 750 63308
3100	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
3101	Res, 10K, 5%, 1/16W, Metalized Glass .	3198 021 31030
3137	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
3146	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
4085	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4087	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4089	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4091	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4101	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4110	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4111	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4112	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4121	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4122	Res, Zero ohm, "Chip" Jumper	3198 021 90030
5004	Coil, 1u5.	3198 018 31580
5005	Coil, 1u5.	3198 018 31580
5006	Coil, 1u5.	3198 018 31580
5008	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5009	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5010	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5011	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5012	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5031	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5049	Inductor, Fixed, 100MHz, 30 ohm. . . .	3198 018 90060
5095	Coil, 5u6.	3198 018 35680
5096	Coil, 5u6.	3198 018 35680
5098	Coil, 5u6.	3198 018 35680
6001	Zener Diode, 3.3 volt.	3198 020 53380
6071	Diode, Regulator, PLVA2656A.	9340 309 20215
6074	Diode, Regulator, PLVA2656A.	9340 309 20215
6077	Diode, Regulator, PLVA2656A.	9340 309 20215
6083	Diode, Regulator, PLVA2656A.	9340 309 20215
6085	Diode, Regulator, PLVA2656A.	9340 309 20215
6086	Diode, Regulator, PLVA2656A.	9340 309 20215
6087	Diode, Regulator, PLVA2656A.	9340 309 20215
6088	Diode, Regulator, PLVA2656A.	9340 309 20215
6092	Diode, Regulator, PLVA2656A.	9340 309 20215
7001	IC, LD1117DT33	9322 134 45668
7002	IC SM SII9993CT100 (SIIM) Y	9322 195 03671
7003	IC, M24C02-WMN6.	9322 145 26668
7004	Transistor, NPN, BC847B.	3198 010 42030
7005	Transistor, NPN, BC847B.	3198 010 42030
7006	F.E.T. Signal, BSN20	9340 125 00235
7007	F.E.T. Signal, BSN20	9340 125 00235
7009	F.E.T. Signal, BSN20	9340 125 00235
7010	F.E.T. Signal, BSN20	9340 125 00235
7011	IC, SM UDA1334BT/N2.	9352 703 94118
7071	IC, TDA8601T/C1.	9351 538 90518
7100	Transistor, NPN, BC847BW	3198 010 42310

Cabinet Parts

	Cabinet Parts	
0010	Cabinet Assembly	3139 177 56121
0011	AC Power Knob Assembly	3139 138 10881
0014	Backcover Sub-Assembly	3121 237 53731
0016	Philips Nameplate.	3141 050 00161
0018	PV2 LENS (USA)	3139 124 39701
0029	Backcover Sub-Assembly	3139 177 75431
0047	Instruction Book, Spanish.	3121 235 21871
0048	Instruction Book, French	3121 235 21911
0049	Instruction Book, English.	3121 235 21791
S 0079	Mainscord, 125V, 10A	3135 010 03831
0084	Quick Use Guide - English.	3121 233 45861
0085	Quick Use Guide - Spanish.	3121 233 45931
0086	Quick Use Guide - French	3121 233 45971
0090	Energy Star Sticker.	3121 233 42971
0250	Small Signal Board Bracket	3139 124 47391
0306	Corner Coil Bracket (2 used)	3104 304 14414
0307	Degaussing Bracket (2 used).	3104 304 14713
0310	Degaussing Coil Clamp.	3104 304 15291
0313	Clip, Anode Lead	3135 014 04471
0940	Front Sub-Assembly	3121 237 54901
1085	Remote Transmitter, RC4331/01.	3128 147 15591
S 1099	CRT, W76ERF072X046	9301 951 50314
1900	Battery, 1.5V AA, 2-Pack, (Not Shown).	9299 000 10137
5020	Coil, Degaussing	2422 549 44256
S 5021	Coil Canceller	3128 138 60662
5105	Speaker Assembly, Slim, 8 ohm, 10W, (2 used).	3139 128 76081

S = Safety Part Be sure to use exact replacement part.

Front Interface Panel

	Front Interface Panel	
CBA	Front Interface Panel.	3139 188 00811
0214	Connector, 5 Pin	2422 025 06353
1000	Switch, Tactile.	2422 128 02742
1002	IR Receiver, TSOP1836UH3V	9322 127 54667
1008	LED.	9322 185 69682
2001	Cap, 100u, 20%, 25v, Electrolytic. . .	3198 025 31010
2002	Cap, 10n, +80/-20%, 50v, Ceramic . . .	3198 019 21030
3001	Res, 560 ohm, 5%, 1/6W, Carbon Film. .	3198 011 05610
3003	Res, 680 ohm, 5%, 1/6W, Carbon Film. .	3198 011 06810
3004	Res, 220 ohm, 5%, 1/6W, Carbon Film. .	3198 011 02210